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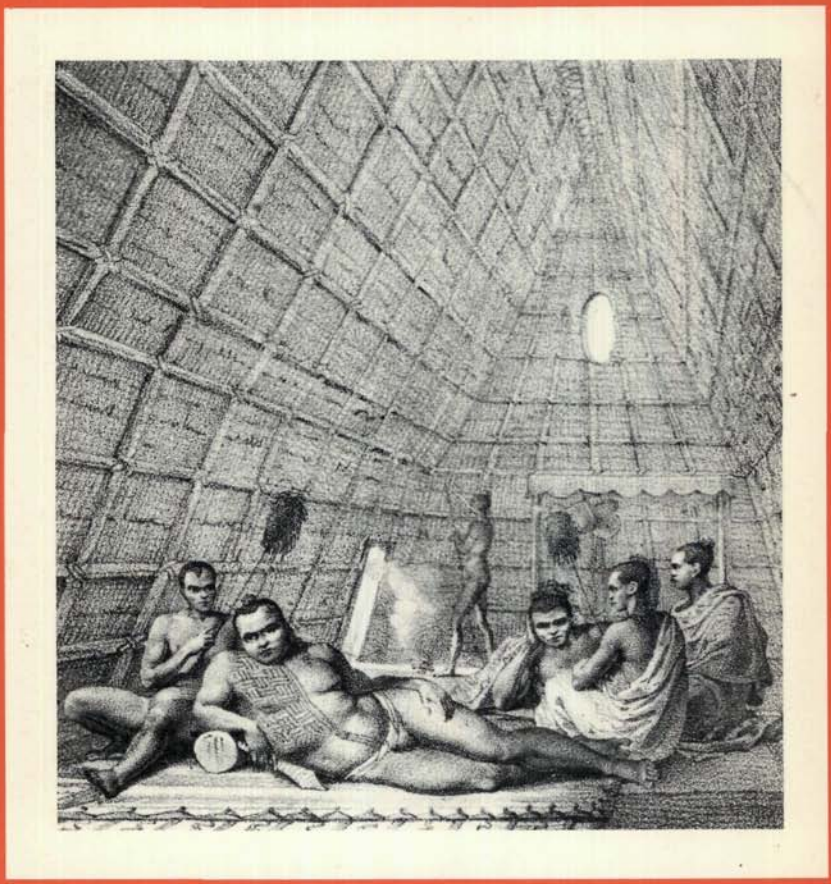

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Prof. Dr. med. habil.

Oberstabsarzt a. D.

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VOL. XIX, No. 3 MARCH 1979

CONTENTS

CAUSE AND EFFECT IN THE EVOLUTION OF THE HOMINID BRAIN
By *F. J. Irsigler* 181

THE RELATION BETWEEN FAMILY SIZE, ORDINAL POSITION AND IQ IN A SAMPLE OF SOUTH MISSISSIPPI SCHOOL CHILDREN
By *David Stephen Engelstad* 193

NEUROTICISM AS A FUNCTION OF THE DEGREE OF ENVIRONMENTAL FREEDOM
By *Henry H. Reiter* and *Michael Simon* 215

THE USE OF HERITABILITIES IN PERSONNEL SELECTION
By *Volkmar Weiss* 221

UNDERSTANDING HUMAN SOCIAL EVOLUTION: THE CONTROVERSY BETWEEN KINSHIP AND SOCIAL MATERIALISM
By *Roger Pearson* 225

THE LINKS BETWEEN FIRE WORSHIP AND ANCESTOR WORSHIP: A SPECULATIVE ESSAY
By *J. W. Jamieson* 239

THE FAIR MOORS OF OCEANIA
By *Marge E. Landsberg* 249

BOOK REVIEWS 265

Cover Picture: A Hawaiian Chief *circa 1820 A.D.*
(See: *The Fair Moors of Oceania*)

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CAUSE AND EFFECT IN THE EVOLUTION OF THE HOMINID BRAIN

F. J. IRSIGLER

J. Huxley, in the first edition of his book on Organic Selection, refers to the so-called "Baldwin effect" (first published in 1897) which is supposed to bring about structural change by change in behaviour. He says: "..... an organism may in the first instance become adapted to an ecological niche merely by behaviour (whether genetic or purely habitual) and any consequent non-heritable modifications, after which mutations for the kind of structural change suitable to the particular mode of life will have a better chance of being selected. Where the modifications are extensive, the process of their replacement by mutations may closely simulate Lamarckism." (Baker, 1974)

Thus the controversy was opened and ever since centers around the temporal and causal relation between genetically determined structure and behavioural expression. Which of the two takes precedence? Behavioural or physical adaptation?

Tobias (1971) calls this kind of chicken-egg argument not particularly fruitful and advocates, instead, a two-sided reciprocity or feedback relationship as suggested by Dobzhansky (1962), R. L. Holloway (1967) and others.

Darwin is quoted to have indicated that tool use is both the cause and effect of hominid bipedalism, and the evolution of erect posture occurred simultaneously with the earliest use of tools. However, feedback reciprocity contradicts the doctrine of irreciprocity upheld by the selective theory of evolution which states that adaptation is not reciprocal between organism and environment; the organism is adapted to the environment and not vice versa. (Simpson, 1958)

Again, feedback mechanism conceals rather than reveals the fundamental distinction between regular succession and causal connection. To apply this kind of reciprocity e.g. to the succession of day and night would mean to miss the common cause of both, in this case, the earth's rotation about its axis.

In South Africa, we are in the fortunate position to have at our disposal three of the best-preserved hominid cranial endocasts in the whole world: two natural, Taung and SK

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1585, a robust Australopithecus from Swartkrans, discovered in 1966 by Dr. C. K. Brain, and a first class replica of the Broken Hill (Northern Rhodesia) endocast whose original specimen is in the British Museum in London which kindly provided me with recent photographs, the same on which G. Elliot Smith based his study in 1928. It revealed the following prominent features:

(1) "striking deficiencies" appearing upon the surface and revealing a definitely more primitive state of affairs: the prefrontal, inferior temporal and upper parietal. These are the same areas which are most prominent in size when recent man is compared with the anthropoid ape and identical with the latest to reach maturity in the modern human child.

(2) In contrast to the exceptionally poor vertical extension of the temporal lobe is its great lateral expansion (width) on the under surface of the cast.

(3) There are two precocious expansions, one on the orbital margin, and the other over the inferior parietal area.

(4) A peculiar and distinctive depression posterior to the prominent orbital margin must mentioned. Sir Elliot Smith's only comment on this reads: it is "probably due to imperfect closure of the Sylvian fissure."

This comment suggested that the imperfect closure of the Sylvian fissure should be regarded as part of a morphogenetic principle fundamental in phylo- and ontogeny of the vertebrate brain, later called morphokinesis by Professor H. Spatz (1937) the late Director of the Berlin Hirnforschungs-institut, and his school. This interpretation was supported by E. Smith's far-reaching statement that the most deficient parts of the convexity of the Broken Hill cast were exactly those to reach the latest maturity in H. sapiens. It was from this point of view that I undertook a study of the three endocasts mentioned above, with the kind permission of the authorities involved to whom are due my sincerest thanks:

Dr. C. K. Brain and Dr. E. S. Vrba from the Transvaal Museum in Pretoria, and Professor P. V. Tobias of Johannesburg.

For a detailed account I refer to my paper contained in the Proceedings of the IXth Congress of the "Union Internationale des Sciences Prehistoriques et Protohistoriques" held at Nice (France) in September 1976.

Morphokinesis is an heuristic principle to explain and to

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understand the organization of the central nervous system in the vertebrates. It means two things:
(1) Hemisphaeric rotation around the Sylvian pivot. This brings the most prominent parts of the cortex into the very positions singled out by Elliot Smith as those of rapid expansion.
(2) "Suppression" (retraction) of the reptilian palaeocortex together with the insula (Reilii) both of which in the process lose the contact with the inner surface of the brain case. This is the meaning of the "deep depression" behind the orbital margin in the Rhodesian skull. It results in the closure of the Sylvian fossa the entrance into which is formed by the frontal, parietal and temporal opercula (= lid or cover) of the expanding neocortex. Its most advanced territories are those covering the under surface of the frontal and temporal lobes, and the one forming the opercular or sylvian neocortex. The former, called "basal neocortex" by Spatz, is important in the display of personality and character traits ("the core of humanity") (Spatz, 1937 and 1962); the opercular cortex is associated with symbolic behaviour incl. speech. Both divisions of the mammalian neocortex have in common that they are in close spatial contact with the ancient (reptilian) palaeocortex and should be considered as the latter's "derivatives."

The crucial feature is the infolding (invagination) of the palaeo- (archi-) cortex from the under surface of the brain before the expansion of the mammalian neocortex has reached such a degree as to be called its "cause." The ancient cortex is not simply pushed aside but is "used up" during the formation of the sylvian cleft and pocket which, from the very beginning, separates sharply the frontal and the temporal lobes. The prosimii (tarsioidea) are the first creatures on the phylogenetic scale to exhibit this feature; up to and including the insectivores (tupaidea) there is no such separation. The phylogenetic sequence just described is reflected, as it were "recapitulated", in the individual development in the human fetus during the second half of pregnancy. At full term the Sylvian fissure is closed. This parallelism is evident on comparing e.g. the brain of an insectivore (hedgehog) with that of an human fetus during the 7th to 9th month of intrauterine life. (Hassler and Stephan, 1966)

According to G. G. Simpson (1958), father of the neo-Darwinian theory, such sequence as dogfish-frog-cat-man is

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not an "evolutionary," that is, historical sequence but is largely ecologically and behaviourally determined. The formation of the sylvian cleft resulting in the emergence of the opercular neocortex which involves the vertebrates from the jurassic mammal-like reptiles up to and including the highest mammalian level indicates a spectacular shift w.r.t. cause-and-effect relationship between organism and environment. Up to and including the insectivores at the beginning of the caenozoic (70 million years B.P.) we have the bauplan of the reptilian brain (Laborit, 1974), a perfect device for orientation in the immediately adjacent space, i.o.w. for short-notice adaptation or presentational immediacy (A.N. Whitehead, 1925). Prehension of the "real world" takes place at close range, in a kind of push-and-pull mechanism whose prototype is the cogwheel and the clockwork. The environmental signals release an on-the-spot response in the form of stereo-typed automatisms, characterized as the alternative: fight or flight ("la lutte et la fuite") in the words of H. Laborit (1974). They correspond to the "reward-and-punishment" pattern, structurally laid down in the reptilian hypothalamus. A frog on whose retina a black spot appears will not budge unless the speck moves in a certain way; then the animal will have to decide whether it deals with its prey or its predator. A mistake at this juncture may be the last one in the animal's life. The aggressive behaviour of a male stickleback is, similarly, not released by the percept "red," but by the more complex "red underneath" (the belly of a rival male) (Tinbergen, 1970). B. Rensch and his co-workers have shown that both fishes and birds can memorize so-called averbal abstract concepts, even of higher order such as similarity and equality. Thus the frog is not a mere automaton. In the amphibian brain are represented not only the motor patterns for "impromptu" use, but all components: cognitive, mnesic, emotional, and the drive or "thrust," to use Pribram's (1971) term, which constitute higher psychic life. The human infant, during the first year of life, reveals the homologue of the reptilian behavioural repertoire. Piaget (1968) calls it the stage of "egocentric or magic causality": everything is within bodily reach of the infant, in its vocational and emotional proximity, in causal interdependence. The whole world seems to be there just to be touched, grasped, ingested or sucked: this is the paediatrician's "oral

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behaviour," grasping reflex and the like.

My first examination of the SK 1585 cast was influenced by Elliot Smith's (1927) interpretation as to the incomplete Sylvian closure. There was at the sylvian notch a layer of matrix giving the impression of there being underneath a local depression corresponding to the one described by Sir Elliot. Re-examination after removal of most of the foreign material made me less certain that the insular portion in fact was exposed indicating a deficient state of opercularization. There is, however, a distinct flattening at the site of the sylvian cleft that is gaping, from the base as well as from the convexity, in contrast to H. sapiens. The first describers of the Australopithecine casts, R. Broom and G. W. H. Schepers (1946) and J. T. Robinson (1950) were apparently unaware of E. Smith's work on the Rhodesian cast and its important message. Regarding the Taung specimen (and Plesianthropus) these three authorities came to the conclusion that "the insular region would be totally operculated." In the 1950 report they state that in early hominids "there is a distinct indentation and change in the direction of the outline. This marks a difference in the character of the sylvian fissure." Unfortunately, in the Taung cast a solid block of matrix obstructs the entrance into the sylvian "notch" to such extent as to prevent assessment of the width and depth of the cleft. "The sylvian fissure is still partly filled with bone, and it is quite manifest that there is a ridge of bone dividing the temporal and the frontal lobes" (Broom and Robinson, 1950, p.81). Though part of this material has been removed since the times of Dart and Schepers interpretation in morphokinetic terms remains conjectural. I am grateful to Professor Tobias for drawing my attention to the fact that this wedge of foreign matter may in part correspond to the so-called sylvian crest (crista Sylvii) which has been claimed by Weidenreich as a characteristic feature of H. erectus. Since, in general, the digitate imprints made by the temporal operculum are absent or poorly developed the whole question of the state of opercularization in the South African prehominids should be regarded as open to discussion and await new discoveries (or a suitable preparation of the Taung cast).

On much safer ground are we regarding the two divisions of the basal neocortex. In the Rhodesian cast, they are deficient in gyration, as already stressed by K. B. Schultz (1931),

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V. Smith-Agreda (1954) and H. Spatz (1962). In E. Smith's picture of the under surface of his cast details of the sulcal pattern are too indistinct to allow comparison; there is no comment either. Schepers has three drawings of the basal view in Plesianthropus and Paranthropus robustus showing the outer contours of the specimens with traces of sulci in the orbital aspect, and two thin wavy lines supposed to represent the temporal sulci on the base – a very primitive state of affairs indeed.

One can only guess that the poor gyration on the temporal base in the prehominids does in fact represent the ancient hippocampo-piriform complex (part of the "olfactory brain" or rhinencephalon). In modern man it is shrunken to a narrow strip near the sagittal plane. This could explain the great lateral (horizontal) expansion emphasized by E. Smith.

Finally, the precocious expansion in the Broken Hill cast of the orbital margin in front of the sylvian notch, corresponding to the posterior end of the inferior frontal gyrus (Broca's area?), "becomes distinctively conspicuous" in both Plesianthropus type 2 and A. africanus (Broom and Schepers, 1946). According to H. de Lumley, "le cap de Broca" is present also in the newly discovered Tautavel fossil, a presumed contemporary of Rhodesian Man. All living anthropoids show, at this site, a conspicuous bulge (Broom and Schepers, 1946).

In summarizing these details it should be clear that the sylvian invagination and its sequelae reflected, as they are, in the evolving human embryo represent a conspicuous though transient stage of pedomorphism. Retaining this feature emergent in the remote phylogenetic history of the vertebrates suggests a phenomenon which, though at first possibly an "accident," in the long run has acquired its own momentum (E. Smith, 1927), that is, has become an ordered sequence involving a shift to a new level in the cause-and-effect relation between organism and environment. The role of pedomorphism in human ancestry has been emphasized by G. R. de Beer, John R. Baker, G. W. Schepers and, for the Taung juvenile, by P. V. Tobias. It is an invariant accompanying the constant rise in brain capacity from the Australopithecinae (mean 500 c.c.) up to and including the classic Neanderthal (1470 c.c.)

G. C. Krantz (1961), in his paper on brain size and culture, sets the lower limit for attaining "virtual humanity" which he equals with the use of symbols at 750 c.c., a threshold passed

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by the modern child at the end of the first year of life. This coincides with the end of the stage of "causality at close contact." He considers this minimum of brain mass just as "necessary for the symbolising ability in the individual as it is in the phylogeny of man."

Although the cranial capacity is a limiting factor in acculturation, cultural objects are a more reliable guide to the psycho-social and spiritual life of our ancestors. The Australopithecines though below Krantz's limit (identical with A. Keith's arbitrary "Rubicon") were, when gauged by the degree of opercularization of their brains, well on their way to true humans, no matter how simian their bodily build and function were. The broken-down and worn-out condition of many of their osteodontokeratic tools confirms unequivocally that they were not used only for ad hoc performance (Dart, 1957) but kept in readiness for future use.

The other trait to be adduced for establishing communicable symbolism at the prelithic level is the habit of persistence or sustained hunting. It aims at running down the game (mostly antelopes) by a horde of hunters, able "to keep the task constantly in mind for several days and to anticipate the results well into the future" (Krantz, 1968). However, group hunting is not a specific trait of the family Hominidae. It is well known that wild dogs and wolves collaborate in this manner.

Lions may drive the game in the direction of other members of the group lying in ambush to effect the kill.

A frightened chimpanzee rattling his cage-wire, or an orang thumping his chest-cage are evidence that these creatures are able to express, by unmistakable gestures, their desires and purposes "hic et nunc," and even to use symbols having an arbitrary relation to their objects. Symbolic behaviour means, in essence, the transition from handling the palpable, visible and audible environment, such as the "Kontaklaute" ("cries of association" Dart), to an arbitrary, intentional relation between meaning and object. The linkage here is not one of physicalistic causality but one of implication lacking the relation of spatio-temporal contiguity, hence time-independent. A symbol, in contrast to an environmental signal, is not superimposed from outside but is a construction of an organism living in a social group held together by certain standards of behaviour, including (in man) symbolic speech. Underlying

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is the drive of thinking and behaving in a specific way. At the symbolic level, the causal law assumes a logical, implicative character such that "the conclusions drawn from it do not concern real experience but its understanding and, therefore, cannot be falsified by any possible experience": this is how Helmholtz defined "causality."

The specific human trait of communicable symbolism consists in the syntactical convention of ordering symbols in a sequence so as to convey meaning in a predicative way (Hormann, 1971). Herein rests the ability of transforming the world (in the Humboldtian tradition) into a property of the mind. The human child reaches the stage of union of symbolic functions, such as play, imitation and the like, with language only between the age of 2 and 8 (Piaget, 1971), that is, when the cranial capacity has increased in excess of the threshold limit suggested by Sir Arthur Keith and Krantz.

Now, the sylvian (or opercular) cortex includes the known cortical speech areas: Broca's in the orbital insular operculum, and Wernicke's (receptive) area covering the posterior portion of the temporal "lid." The parietal operculum which occupies the posterior circumferences of the sylvian fissure and the upper temporal sulcus (i.e. Brodmann's areas 30 and 40) has long been known as the site for auditory, visual and tactile (kinaesthetic) integration ("cross-modal transfer," Geschwind, 1965). Recently, it was claimed by A. R. Luria (1970) as a centre for spatial orientation and for "higher cortical functions," such as logico-grammatical abstraction and conceptualization. It coincides roughly with the territory called "carrefour sensitif" by the older French neurological school.

This conception of discrete cortical functions with their "association areas" and their mutual links, all displayed in two dimensions, has its obvious shortcomings. Clinical analysis runs into a confusing combinatorial medley of syndromes (especially with regard to disturbances of speech; there are no less than seven different types of "aphasia"). In palaeo-neurology, the "chess-board view" induces a kind of interpretation which puts those cortical zones responsible for manipulation, tool handling and weaponry into the foreground making them both the cause and effect of human acculturation. A paradigm is the Russian authoress V. I. Kotchetkova's paper on the "specifically human regions of the cerebral cortex in

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the hominids" (1960). This view prevails in those parts of the world where the dialectical (historical) materialism is offered as the official party doctrine. As an alternative to such hypothetical fragmentation into a network of distinct cortical zones based on Brodmann's mapping, what is offered here is the hierarchical disposition of cortico-fugal connexions (K. H. Pribram, 1971) as displayed in the phylo- and ontogenetic sequence from the environmental signal through the verbal sign with its acoustic and kinaesthetic attributes Hormann, 1976) and symbol formation to propositional (symbolic) language. This involves a shift from the mechanistic reciprocal interaction with the environment to the realm of noetic representation of "reality." This view is supported by the continuity of the sylvian cortex with the subcortical limbic system, the equivalent of the ancient palaeocortex, that is our "reptilian heritage," as indicated by the principle of morphokinesis. In addition, the sylvian fossa is not only an axis for the hemisphaeric rotation but, at the same time, a centre of the gradient of cortical maturation (Kahle, 1969): the strata of equal maturity are displayed in successive concentrical layers onion-like around the sylvian "pivot." This indicates that the limbic cortex is indispensable for the cognitive and emotional drive in infantile motivation during the early period of psychogenesis as well as for the later symbolic prehension of reality (Ergreifung des Wirklichen, H. Dingler).

Conclusion

The problem of casuality emerges in the evolution of the hominid brain at two different levels and is in turn reflected in the ontogenetic development and psychogenesis of the vertebrate brain.

(1) The mechanistic causality of "close contact" (Popper-Eccles, 1977) corresponds to the palaeocephalic "reptilian" allocortex, characterized by interaction with the immediate vicinity (spatio-temporal contiguity). Its correlate is the sensory-motor intelligence of the infant during the first year of life. The causal direction here hinges on temporal priority implied by the "objectivity" of nature, the background of Monod's "fundamental dilemma" (1972).

(2) The sylvian (opercular) neocortex is a logical and constructive extension of the palaeocephalic (limbic) system from

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which it derives its emotional drive. It represents the level of symbolic behaviour and, eventually, of causal or purposive language (Hanson, 1961), the outcome of an heuristic and methodological construction. Instead of causal and temporal precedence we have here an implicative (deductive) series aimed at understanding and explaining environment. Dialectical materialism tries to interpret symbolic behaviour in terms of a conglomerate of cortical fields layed out at the convexity of the brain. It neglects the "core of humanity" (Hassler and Stephan, 1966) at the base and identifies manual work and skill with hominization. The utmost one can achieve in this way is the level of the chimpanzee. Work on the endocasts of South African protohominids suggests replacement of the mechanistic view by a more realistic interpretation along morphokinetic lines.

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THE RELATION BETWEEN FAMILY SIZE, ORDINAL POSITION AND IQ IN A SAMPLE OF SOUTH MISSISSIPPI SCHOOL CHILDREN

DAVID STEPHEN ENGELSTAD

The Problem

Recently considerable attention has been focussed upon evidence which indicates an inverse relationship in contemporary western societies between family size and the IQ of children in a family. Generally, the larger families seem to be correlated with a lower IQ among the children tested. This evidence has been interpreted by some researchers to imply that the children of larger families are in some way environmentally handicapped, and that their performance on IQ tests is somehow related to environmental factors associated with large families. In it has been argued by some of these researchers that later born children will similarly be handicapped in contrast to earlier born children, and will likewise be inclined to show poorer results when performing IQ tests. However, this latter contention has not been consistently supported by research, and test results reveal no clear pattern associating ordinal position in the family with IQ test results.

Some researchers, such as Kim Hufman (1976), writing in the *American Psychological Association Monitor,* have offered an alternative explanation to the inverse correlation between IQ and family size, suggesting that just as family size varies according to social class, so parents of lower IQ may on the average have larger families than parents of higher IQ. A similar hypothesis has been proposed by Anastasi (1959) who also regarded the IQ of parents as being a relevant factor which should be taken into consideration when attempting to relate IQ to family size. In other words, parents with lower IQ may tend to be associated with socio-economic and cultural conditions which are conducive to the production of larger families, while parents of higher IQ may predominate in socio-economic and cultural environments which discourage large families.

By extension, since many demographic studies have revealed differential birthrates among various ethnic groups in contemporary western societies, and at the same time IQ studies have

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also frequently indicated differential IQ performance on an ethnic basis —for whatever reasons this may be attributed to — an argument may also be made for the control of ethnic factors in attempts to study the relationship between family size and the performance of children in IQ tests. In view of the above, the present analysis of IQ in relation to family size and ordinal position may be of some value, in so far as the children tested were all drawn from the same homogeneous ethnic background, being white students in a private academy in essentially rural southern Mississippi. Because of the ethnic homogeneity of the students, any correlation which could be identified would be clearly disassociated from extraneous ethnic factors. Likewise, the absence of any correlation between IQ and family size might be taken as indicating the possibility that IQ, family size and ethnic background might be in some way related, and further studies along this line of enquiry would be indicated by our results.

Statement of the Problem

The present experiment therefore examined the relationship between family size and IQ, as well as ordinal position, among a group of children drawn from an essentially homogeneous ethnic and class background. IQ was measured by the Primary Mental Abilities Tests (PMA). The hypotheses to be tested were as follows-

1. Family size reveals an inverse relationship with:
   a. overall cognitive development, determined by the *PMA* Total score.
   b. the Verbal Meaning score.
   c. the Number Facility score.
   d. the Reasoning score.
   e. the Spatial Relations score.
   f. the Perceptual Speed score.

2. Ordinal position reveals an inverse relationship with:
   a. overall cognitive development, determined by the *PMA* Total score.
   b. the *PMA* Verbal Meaning score.

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c. the *PMA* Number Facility score.
d. the *PMA* Reasoning score.
e. the *PMA* Spatial Relations score.
f. the *PMA* Perceptual Speed score.

Definitions of Terms Used

Family Size: This term states how many children were in any subject's family at the time of testing. Information on incomplete families, death of siblings, miscarriages, abortions, step-siblings. It is assumed that living children in and out of the home were counted.

Ordinal Position: This was the order of birth for any subject in relation to siblings. Only living siblings, in or out of the home, were assumed to be counted. Birth order was used with the same meaning.

Cognitive Ability: This denotes the intellectual functioning of the subject and is used synonymously with intelligence and IQ. There are single factors of the intellect that require different abilities and these have been combined in the *PMA* to give an overall index of cognitive ability.

The 1962 revision of the *PMA* was used to measure intelligence. This test was developed using Thurstone's factor-analytic research on test construction (Anastasi, 1976). Although he found a number of factors of intelligence, those that appeared to be most relevant to education were incorporated in the *PMA*. These factors included Verbal Meaning, Number Facility, Reasoning, Spatial Relations, and Perceptual Speed, which are combined to give a Total score for IQ (Thurstone and Thurstone, 1962). As noted below, not all factors are used at all age levels.

The manual of the *PMA* describes these factors as follows:

Verbal Meaning (V): The ability to understand ideas expressed in words. In the later school years, this is the most important single index of a child's potential for handling academic tasks. At the lower levels, it is tested by a vocabulary test in picture form; at the upper levels, by a verbal vocabulary test.

Number Facility (N): The ability to work with numbers, to handle simple quantitative problems rapidly and accurately, and to understand and recognize quantitative differences. At the lower grade

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levels, the number scores are determined by a pictorial test that requires no reading. Addition problems are also used. At the upper levels, arithmetical reasoning problems are included.

Reasoning (R):The ability to solve logical problems. Separate measures of this ability are not provided in the batteries designed for grades Kindergarten through to 4th. In the 4th-6th grade battery, it is measured by word-grouping and figure-grouping tests; at the upper levels, by word-grouping, letter-series, and number-series tests.

Perceptual Speed (P): The ability to recognize likenesses and differences between objects or symbols quickly and accurately. This ability is important in acquiring reading skills, but tends to reach a plateau at a relatively early age. For this reason, it is included only with the three batteries designed for the lower grades.

Spatial Relation (S): The ability to visualize objects and figures rotated in space and the relations between them. The test measuring this ability appears in every level of the *PMA* and is important throughout the school years.

Despite having certain technical shortcomings, reported by Anastasi (1976), this test was chosen because it is a group test that provides a global IQ score and separate factor of IQ scores.

Limitations of the Study

Certain methodological shortcomings need to be explained to provide the reader with an accurate perception of this study. They are:

1. *Occupational Background*: The study which is being analysed here did not control for either occupational background or social class. On the other hand, the fact that the subjects were enrolled by their families in a local private academy, of not inconsiderable cost, suggests clearly that the subjects were of middle class background. In addition it should be noted that Anastasi (1956) and Belmont and Marolla (1973), both of whom had noted an inverse relat-

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ionship between family size and IQ, reported that this relationship persisted in differing social classes.

Belmont and Marolla (1973) also showed no indication of any correlation between IQ, ordinal position, and social class. This decreases the possibility that any differences in social class might be a confounding variable for this part of the study.

2. *Intelligence of Parents*: The data under analysis unfortunately contained no information in respect of the intelligence of parents, which as already indicated should be taken into consideration when looking at the relationship between family size and IQ.

3. *Confounding variables for ordinal position.* The sex of a child's sibling, the interval between siblings, and the sex of the subject have all been observed to be confounding variables in the relationship between ordinal position and IQ (Chittendon, Foan, Zweil, Smith, 1968; Kock, 1954; Schoonover, 1959). None of these variables were controlled, making it more difficult to interpret the significance of any correlation between ordinal position and IQ.

Review of Related Literature

Family Size

Research to date has generally supported a negative correlation between family size and IQ. Terman (1925), in his studies of 1000 children discovered a statistically significant negative correlation between family size and intelligence. In his study of this relationship, he used 309 children from 91 completed families as subjects in order to examine the overall effect of family size on all children within different family sizes.

Lentz (1927) set out to challenge the current belief of a native fixed IQ and to show that environmental factors, such as family size, were related to IQ. He studied data accumulated from over 4000 subjects and reported a negative correlation between family size and IQ across groups differing in age and geographic location, but did not identify ethnic background.

Anastasi (1956) found the same inverse relationship, which tended to disappear in the upper social classes. Studies by Douglas (1964), Nisbet and Entwistle (1967), and Belmont

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and Marolla (1973) have supported this reduction of the correlation between family size and IQ in the upper social classes.

Eysenck and Cookson (1970) studied the relationship of family size to personality factors, IQ, and achievement with 4000 11-year-old subjects. They concluded that family size revealed an inverse correlation with higher IQ scores being associated with smaller families. However, they used only a Verbal Reasoning test to determine IQ, did not control for social class, and did not investigate the personality, IQ, or achievements factors of the parents.

Nesbit and Entwistle (1967) studied 2868 children at ages 7, 9, 11, and 12 to determine the longitudinal effects in the relationship between family size and intelligence. Negative correlations remained fairly constant throughout these years suggesting an influence of family size on IQ before the age of 7. They also found that tests composed of verbal items showed a higher negative correlation with family size. This finding not only raised questions on the relationship between family size and verbal acquisition in the home, but suggests that previous research findings may have been influenced by verbal items on an IQ test.

Belmont and Marolla (1973) found an inverse relationship between family size and intelligence using a non-verbal test, a Dutch modification of the *Raven Progressive Matricies*. They studied data on 400,000 19-year-old men from the Netherlands and controlled for social class by using the occupation of the subjects' fathers. Again, the inverse relationship was not as strong in the upper social classes; but the study contradicted earlier evidence that differences in verbal performance on the IQ tests accounted for the differential scores for family size.

Despite the prevalence of literature supporting an inverse relationship between family size and intelligence, some contrary findings have been reported. Cicirelli (1967) concluded that there was no significant interaction between family size and intelligence although recognizing the limitation of a small sample size. Altus (1959) studied data from 15,000 illiterate soldiers who were given an orally-administered IQ test. Soldiers from families of extreme sizes (1, 2, 12, 13) scored significantly better than soldiers from intermediate-sized families. These findings again question the influence of verbal fluency and/or acquisition in relation to family size.

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Anastasi (1959) has stressed the importance of parental intelligence, social status, loss of parent, incomplete families, and other factors when studying the relationship between family size and intelligence.

Ordinal Position

Research on the relationship between ordinal position and IQ has not been as consistent as that concerning family size and IQ. Early researchers noted a relationship between birth order and achievement when they studied prominent men and found a predominance of first-borns (Galton, 1874; Yoder, 1894; Ellis, 1904). Cattell and Brimhall (1921) later studied the starred men in *American Men of Science* and reported that first-borns were consistently over-represented in all family sizes to a significant level.

Schachter (1963) looked at this finding and hypothesized that it was possible that first-borns may have had greater educational opportunities than later-borns, accounting for the over-representation of first-borns in the scholastic field.

Terman (1925) studied 1000 gifted children and found that the order of predominance was first-borns, last-borns, and in-between children. Altus (1966) studied undergraduates, samples of 1800 and 2500, and observed that first-borns tended to score higher on a verbal intelligence test. He inferred that his studies, in combination with Terman (1925) and Nichols (unpublished), tend to support the relationship between birth order and intelligence in brighter populations, first-borns performing better in intelligence tests.

In contrast, Thurstone and Jenkins (1929) reported that later-borns were on the average brighter than earlier-borns They studied the effects of birth order on intelligence with 1500 students from the Illinois Institute of Juvenile Research. They used the *Stanford-Binet*, an individually-administered intelligence test, to determine the IQ and controlled for family size and socio-economic class. These results may have been atypical because the subjects employed were characterized by anti-social behavior and had a mean IQ of 80, considerably below the mean IQ of the American population.

Kock (1954), in her study of 5- and 6-year olds, found that second-borns tend to do better than first-borns. At that age, the sex of the sibling had an effect upon intelligence, further

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complicating the effects of birth order. She used the *PMA*, explained in the Definition of Terms section of this paper, and reported significant influences of birth order on the Perceptual Speed test and on the Total test score. Verbal and Numerical tests showed effects of birth order, but only in combination with other variables. This study supported the findings of Thurstone and Jenkins (1929).

Altus (1965) studied the relation of ordinal position to mathematical aptitude and verbal aptitude. Although sex of the subject was a confounding variable, he concluded that first-borns had significantly higher scores on the verbal aptitude test, while showing no significant differences for mathematical aptitude. But in studying army illiterates, Altus (1959) observed that later-borns had higher IQ scores than early-borns. Overall, it would appear from these studies that the only ordinal differences in IQ scores related to verbal aptitude.

Burton (1968) studied the relationship of birth order to intelligence in a study of data accumulated from over 40,000 high school seniors. Two, three, four, and five child families were studied, controlling for sex and social class. Results showed no significant pattern for intelligence by birth order. This research was supported by the findings of Schoonover (1959), Hsiao (1931), and Jones and Hsiao (1928). All found birth order to have no significant effect on intelligence.

In contradiction of these findings, a negative relationship between birth order and IQ was claimed by Belmont and Marolla (1973). They studied non-verbal IQ scores of 400,000 19-year-old men in relation to birth order and family size. Controlling for social class, they observed that intelligence decreased as the ordinal position became greater. This finding was consistent across social class.

In summation, any relation between ordinal position and cognitive ability is complicated by a variety of factors including IQ level of subjects, sex of siblings, sex of subjects, type of tests used and others. Only a few of the above studies, however, dealt with racially or ethnically homogeneous populations, and inadequate attention was given to ethnic composition.

Method

Subjects

The subjects were all students at a private academy in

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southern Mississippi – Columbia Academy in Columbia, Mississippi. All of the students were White or Euro-American. Genealogical data, including information on national origins, were received from nearly 200 families. Approximately 90% of the families were of English, Scotch, and Scotch-Irish origin. Almost all of the students were Protestant in religious background, with the majority of the Baptist denomination.

Columbia Academy is located in a predominantly rural area of southern Mississippi, with a clearly ethnically homogeneous student body derived from middle class occupational groupings i.e., farmers, construction workers, clerical workers, teachers, engineers, doctors, lawyers, police officers, and small businessmen. In subsequent papers the social status of the families will be systematically scaled and evaluated. However, preliminary analysis of the questionnaires relating to the education and occupation of the parents indicates that almost all of the families whose children were enrolled at Columbia Academy were middle-class to upper-middle-class in socio-economic status.

In the Fall of 1975 Mr. Donald A. Swan, Assistant Professor of Anthropology at the University of Southern Mississippi, initiated an anthropological and psychological study of American school children of Anglo-Saxon origin. Anthropometric, dermatoglyphic, serological, intelligence and personality test data were obtained from school children at three private academies in southern Mississippi. The psychological research was directed by Dr. Ralph Scott, Director of the Educational Clinic at the University of Northern Iowa in Cedar Falls, Iowa. The Primary Mental Abilities (PMA) test of intelligence was administered to 498 students in grades kindergarten through 12 at Columbia Academy. The students ranged in age from four years four months to eighteen years.

Procedure

All subjects were tested within a two week period in January of 1976 by the author. The PMA intelligence test was group administered during the regular school day, with teachers from the academy assisting in supervision. Information about family size and ordinal position was obtained in November and December 1975 when the anthropometric measurements were made of the subjects. For purposes of statistical analysis, family

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size was recorded from one to six and over and birth order was recorded as first to sixth and over.

Results

Table 1 presents the distribution of the mean scores on the PMA Total IQ test and the five PMA IQ factor tests by family size. For the Total IQ test and for the Verbal IQ, Number IQ, Reasoning IQ, and Perceptual IQ subtests, the mean IQ scores tend to decrease slightly with increasing family size. Thus, the mean Total IQ score ranges from 103.90 for one-child families and 104.73 for two-child families to 99.74 for five-child families and 97.67 for families with six or more children.

Table 1

The Distribution of the Mean Scores of the PMA Total IQ and the PMA IQ Factors by Family Size*

FAMILY SIZE	TOTAL IQ	VERBAL IQ	NUMBER IQ	REASON IQ	SPATIAL IQ	PERCEPTUAL IQ
1	103.90	104.78	104.51	105.29	102.92	105.67
	(51)	(51)	(51)	(31)	(51)	(30)
2	104.73	104.98	102.79	106.94	104.88	106.24
	(147)	(147)	(147)	(107)	(147)	(81)
3	102.85	102.35	101.54	102.43	105.35	104.13
	(134)	(134)	(134)	(97)	(134)	(61)
4	102.57	99.92	101.48	102.56	104.73	107.52
	(84)	(84)	(84)	(64)	(84)	(33)
5	99.74	99.33	101.10	102.84	102.53	97.65
	(58)	(58)	(58)	(49)	(58)	(17)
6 & over	97.67	95.88	101.83	103.29	97.96	101.71
	(24)	(24)	(24)	(21)	(24)	(7)
	NS	$P < .05$	NS	NS	NS	NS

* The number of subjects in each family size and IQ category is recorded in parentheses below the mean IQ.

Only in the case of Verbal IQ, however, is the relation between IQ and family size large enough to be statistically significant. Here, the mean Verbal IQ ranges from 104.78 for

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single-child families and 104.98 for two-child families to 99.33 for five-child families and 95.88 for families with six or more children. Analysis of variance shows a minor though statistically significant difference between mean Verbal IQs at the .05 level of confidence.

In the case of Number IQ, the highest score is found among single-child families with a mean IQ of 104.51, followed by two-child families, with a mean IQ of 102.79, but these differ but little from the mean Number IQ of the larger family size categories (ranging from between 101.83 and 101.10).

A somewhat similar pattern is found in the distribution of the Reasoning IQ scores by family size. The IQ scores are highest for two-child families, with a mean Reasoning IQ of 106.94, and a range of 105.29 down to 102.43 for the other family size categories. This, as with other IQ scores except the verbal, shows no ordinal rating.

The Perceptual IQ test formed part of the PMA test series which was administered only to the lower grades. Consequently, the sample sizes were much smaller. The total number of subjects for whom Perceptual IQ test data were available was 229. The highest mean Perceptual IQ score was found in the four-child family category (score 107.52), the second highest in the two-child family category, and the lowest in the five-child family. The six-child family score was higher than the five-child family score, and again no ordinal pattern existed.

A different pattern in the distribution of IQ scores by family size is found in the case of Spatial IQ. Here, the highest mean Spatial IQ of 105.35 is found for three-child families. Two-child and four-child families have similar scores of 104.88 and 104.73 respectively. One-child families with a mean Spatial IQ of 102.92 take fourth place, followed by five-child and six-child families. Again, it is not possible to identify any pattern in relation to family size, and the differences are not great.

Table 2 presents the distribution of the mean scores on the PMA Total IQ test and the five PMA IQ factor tests by birth order or ordinal position. For the Total IQ test and for the Verbal IQ subtest, the mean scores tend to decrease slightly as the birth order increases. Thus, for Total IQ the mean score for first-borns is 103.97 and for second-borns is 102.98. But, for fifth-borns the mean Total IQ is 100.59, while for sixth- and later-borns, the mean is 98.30.

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Table 2

The Distribution of the Mean Scores of the PMA Total IQ and the PMA IQ Factors by Ordinal Position*

BIRTH ORDER	TOTAL IQ	VERBAL IQ	NUMBER IQ	REASON IQ	SPATIAL IQ	PERCEPTUAL IQ
1	103.97	104.47	102.53	105.62	104.29	104.81
	(184)	(184)	(184)	(130)	(184)	(102)
2	102.98	101.31	101.97	102.80	105.82	106.72
	(146)	(146)	(146)	(107)	(146)	(65)
3	100.88	100.91	101.81	100.62	102.03	105.20
	(86)	(86)	(86)	(65)	(86)	(35)
4	103.98	102.08	101.65	108.43	105.17	100.79
	(47)	(47)	(47)	(37)	(47)	(14)
5	100.59	99.36	102.90	104.40	103.54	100.00
	(22)	(22)	(22)	(20)	(22)	(7)
6 &	98.30	96.31	101.84	104.20	95.53	104.33
over	(13)	(13)	(13)	(10)	(13)	(6)
	NS	NS	NS	$P < .05$	NS	NS

* The number of subjects in each ordinal position and IQ category is recorded in parentheses below the mean IQ.

A similar pattern occurs in the case of Verbal IQ. The highest mean Verbal IQ of 104.47 is found among first-borns. For fifth-borns the mean Verbal IQ is 99.36 and for sixth- and later-borns the mean is 96.31.

However, there is virtually no birth order effect in the case of number IQ. The mean Number IQ scores are almost identical for each of the six ordinal position categories. They range from 101.65 for fourth-borns to 102.90 for fifth-borns.

The distribution of the Spatial IQ scores by ordinal position is somewhat similar to that for Number IQ. For the first five birth order categories, the mean Spatial IQs differ only slightly. The scores range from 105.82 for second-borns to 102.03 for third-borns. However, for sixth- and later-borns, the mean Spatial IQ declines to 95.53.

For Perceptual IQ, lower mean scores are found for fourth-borns and fifth-borns. They are 100.79 and 100.00 respectively. However, for this subtest the sample sizes are considerably smaller.

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Figure 1

The Relation between
Verbal IQ and Family Size

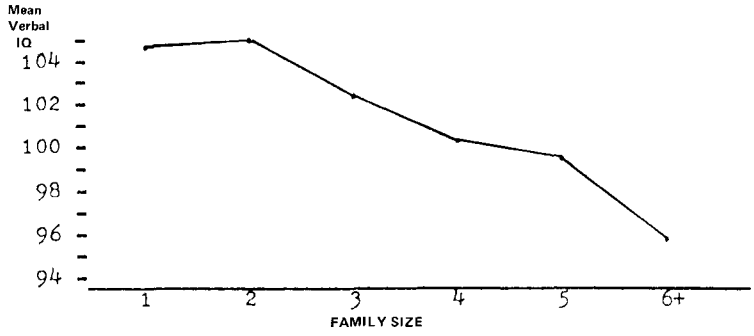
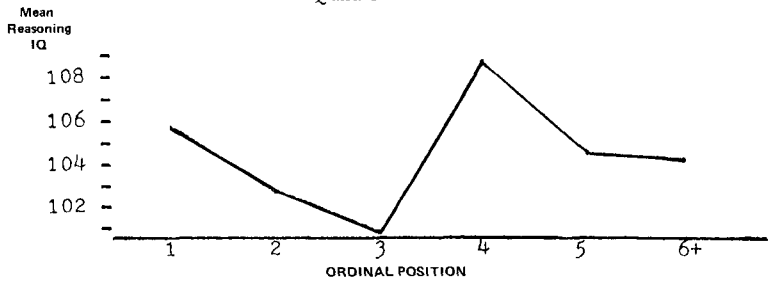


Figure 2

The Relation between Reasoning
IQ and Ordinal Position



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Only in the case of Reasoning IQ are the differences between mean IQs by ordinal position large enough to be statistically significant. Here, the highest mean Reasoning IQ of 108.43 is found among fourth-borns. The lowest mean of 100.62 is found among third-borns. For the other four birth order categories, the mean Reasoning IQ ranges from 102.80 for second-borns to 105.62 for first-borns. Analysis of variance shows a statistically significant difference between mean Reasoning IQs at the 0.5 level.

The statistically significant relationship between family size and Verbal IQ is graphically represented in Figure 1. The statistically significant birth order correlation with Reasoning IQ is graphically represented in Figure 2. Tables 3, 4, 5, and 6 present the interrelations between family size, birth order, and IQ for Total IQ, Verbal IQ, Number IQ, and Reasoning IQ.

For Total IQ, first-borns of two-child families, with a mean IQ of 105.35, obtain a slightly higher score than second-borns, with a mean of 103.99, but three-child-families, the second-borns obtain a higher mean Total IQ than either the first-borns or third-borns. In four-child and five-child families, the later borns score slightly higher Total IQ test than earlier-borns.

For Verbal IQ also, first-borns of two-child families, with a mean of 106.30, score higher than second-borns or single-children. Second-borns obtain a mean Verbal IQ of 103.40, while single-children obtain a mean of 104.78. However, in three-child families, first-borns score slightly higher than second-borns, who in turn score higher than third-borns. In four-child families, the third-borns and fourth-borns obtain higher mean Verbal IQs than the first-borns and second-borns. In five-child families, the fifth-borns obtain the highest mean Verbal IQ and the third-borns the lowest. The IQ scores are nearly identical for the other three birth order categories.

In the case of Number IQ, single-children, with a mean score of 104.51, obtain a slightly higher score than either first-borns or second-borns of two-child families. For the latter category, first-borns obtain a mean Number IQ of 103.33, while second-borns obtain a mean of 102.15. For three-child families, second-borns obtain a higher mean Number IQ than either first-borns or third-borns. For four-child families, third-

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Table 3

The Distribution of PMA Total IQ by Family Size and Ordinal Position

FAMILY SIZE	ORDINAL POSITION 1	2	3	4	5	6+
1	103.90 (N=51)					
2	105.35 (80)	103.99 (67)				
3	102.58 (38)	105.40 (50)	100.31 (46)			
4	101.00 (12)	96.42 (19)	104.55 (22)	105.55 (31)		
5	98.33 (3)	97.67 (9)	96.71 (17)	101.92 (13)	102.63 (16)	
6+	---	87.00 (1)	118.00 (1)	96.67 (3)	95.17 (6)	98.31 (13)

Table 4

The Distribution of PMA Verbal IQ by Family Size and Ordinal Position

FAMILY SIZE	ORDINAL POSITION 1	2	3	4	5	6+
1	104.78 (N=51)					
2	106.30 (80)	103.40 (67)				
3	103.84 (38)	102.06 (50)	101.44 (46)			
4	96.00 (12)	93.37 (19)	102.64 (22)	103.52 (31)		
5	98.33 (3)	99.67 (9)	96.47 (17)	99.85 (13)	101.94 (16)	
6+	---	84.00 (1)	114.00 (1)	97.00 (3)	92.50 (6)	96.30 (13)

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Table 5

The Distribution of PMA Number IQ by Family Size and Ordinal Position

FAMILY SIZE	ORDINAL POSITION 1	2	3	4	5	6+
1	104.51 (N=51)					
2	103.33 (80)	102.15 (67)				
3	98.66 (38)	104.74 (50)	100.44 (46)			
4	101.75 (12)	97.58 (19)	103.91 (22)	102.03 (31)		
5	100.33 (3)	96.56 (9)	102.53 (17)	101.69 (13)	101.81 (16)	
6+	- - -	85.00 (1)	107.00 (1)	97.67 (3)	105.83 (6)	101.85 (13)

Table 6

The Distribution of PMA Reasoning IQ by Family Size and Ordinal Position

FAMILY SIZE	ORDINAL POSITION 1	2	3	4	5	6+
1	105.29 (N=31)					
2	107.39 (59)	106.38 (48)				
3	101.77 (26)	103.66 (35)	101.69 (36)			
4	105.36 (11)	91.87 (15)	98.29 (14)	110.46 (24)		
5	108.67 (3)	99.25 (8)	98.79 (14)	105.90 (10)	105.50 (14)	
6+	- - -	94.00 (1)	120.00 (1)	100.67 (3)	101.83 (6)	104.20 (10)

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borns and fourth-borns score slightly higher than first-borns and second-borns. In five-child families, the highest mean Number IQ is found among third-borns and the lowest among second-borns.

For Reasoning IQ, children of two-child families obtained higher scores than all other family categories, although the highest scores (apart from a single high score of 120 obtained by the sole representative of the third child category in six or more children families) were obtained by the first-born children in five-child families, with two-child families showing the highest overall achievement in this type of test. For four-child families, likewise, the highest scores were obtained by first-borns and fourth-borns, so that it is not possible to identify any pattern in these test results.

Discussion

The study examines the relationship between family size and ordinal position on PMA Total and subtest IQ scores among a school population comprising a relatively homogeneous group of children from essentially similar genetic and environmental backgrounds. Because of this relative genetic, class, ethnic, and geographic homogeneity, any significant differences in performance in IQ tests would be more likely to result from environmental influences associated with size of family or ordinal position of birth — if such factors are indeed causally related to IQ — than would otherwise have been the case. However, no statistically significant relationships were found, except for a relatively minor inverse relationship between family size and performance of children on the PMA Verbal Meaning test, and a statistically significant relationship, again at a relatively low level, which was identified in the case of ordinal position and the PMA Reasoning test. Tests of linearity revealed no significant inverse relationships.

Zajonc (1975) hypothesized that the more exposure of a child to its parents, the greater the stimulation of the child's thought process. The relationship between ordinal position and verbal ability may well be explained by this. A child from a smaller family might converse more with adults than a child from a larger family, and consequently acquire at least a temporary superiority in verbal ability, which may or may not persist into later life. At the same time, no significant relationship

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between verbal ability and ordinal position was demonstrated, or need be expected if this hypothesis holds true.

Clark (1916), in discussing ordinal position, suggested that earlier-borns might similarly benefit from a greater variety and quality of educational experience than later-borns, and that smaller families might also be able to give their children better opportunities, which would enhance their verbal expression and understanding.

The effect of ordinal position on the Reasoning test requires the reader to look at the breakdown of scores by birth order and family size in Table 6, as well as in Table 1. It appears that children born at the extremes of family sizes 4 and 5 scored higher than the middle-borns, while showing no clear pattern for family sizes 1 through 3. Rather than speculate as to the family dynamics that may have caused these results, it seems preferable to encourage further related research, studying ordinal positions among larger families with respect to a Reasoning test. Experimentation including large samples should clarify these results.

One noticeable trend of scores can be seen by looking at Table 1 and Tables 3-6. On Table 1, five of six mean scores for family size 1 were lower than family size 2. Tables 3-6 show that on three of four tests, the first-borns of two-child families scored higher than only children. This was also true for second-borns from two-child families. Belmont and Marolla (1973) observed that an only child scored lower on an IQ test than first-borns of a two-child family.

This trend suggests some degree of interaction in a two-child family, not experienced in a one-child family, that increases cognitive ability. One explanation might be that with two-child families, first borns, along with their parents, are teachers of their siblings, enhancing their own ability as well as the second-borns'. This teaching effect would not be present in a one-child family, accounting for lower scores on tests of ability.

Kock (1954) placed emphasis on the competitive element between siblings, resulting in more desire to excel in a two-child family than in a non-competitive one-child family. This theory would not hold for families of more than two children because of the decrease in scores with larger families.

One final observation of the data is concerned with the consistent performance of subjects. Tables 1 and 2 show a

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narrow band of scores on the Number Facility test for family size and ordinal position, with the exception of only children. This fact merits attention in that tests involving numerical ability might be of high value in determining IQ when there is threat of interference from other variables, such as family size.

Conclusion

The results of the tests indicated that neither family size nor ordinal position of birth were sufficiently correlated with IQ merit in the ethnically homogeneous population under study to support the inference that family size or ordinal position of birth are inherently or causally related to IQ, except possibly in relation to verbal ability. Instead, further research is indicated in the relationship between family size, ethnic and class background, and performance in IQ tests, with especial emphasis being given to any potential correlation between the IQ of parents and family size in relation to ethnic background, class background and IQ of children.

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NEUROTICISM AS A FUNCTION OF THE DEGREE OF ENVIRONMENTAL FREEDOM

HENRY H. REITER and MICHAEL SIMON

The effects of freedom were examined as a function of control over the environment. Neuroticism profiles were recorded as dependent variables. The Schier and Cattell Neuroticism Scale Questionnaire was administered to 120 male subjects (*Ss*). *Ss* were recruited from populations varying in group freedom: a prison; a Catholic high school; and residents at a liberal arts college. Lack of freedom was a significant factor for the group neuroticism index and group anxiety scores. No significant results were obtained for scores on overprotection, depressiveness, and submissiveness.

Fromm (1941) hypothesized that as man achieves greater amounts of freedom, there would follow an increasing rise in the index of neurotism. Previous research can be interpreted as not supporting the hypothesis. Monro (1963) measured social attitudes of neurotics and inadequate personalities and reported that neurotics exhibited more anti-social behavior.

Comier and Williams (1966) in a sociological review, reported that excessive deprivation of liberty is a factor in producing deep emotional disturbances; aggression, withdrawal, and rage. This is seen as further documentation against Fromm's hypothesis.

Eysenck and Eysenck (1970), using the Eysenck Personality Index, compared the neuroticism scores of male prisoners; married men, students, and industrial apprentices. It was observed that prisoners had a significantly higher score in neuroticism. It may be inferred that prisoners lacked significant control over their environment. A more recent study (Eysenck and Eysenck, 1971) concluded that prisoners had significantly higher neuroticism indices.

It had already been stated that freedom affects the level of neuroticism. It can be inferred that lack of freedom produces higher levels of measurable neuroticism. The purpose of the present study was to compare relative degrees of environmental freedom and relate these to neuroticism. Freedom here was defined as the degree of control members of a common group exhibit over their environment.

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Method

Subjects

Ss were randomly selected and divided into three groups reflecting different levels of group freedom. Group I was representative of the class of individuals reflecting little or no control over their environment. *Ss* were 40 male inmates from a penitentiary situated on Long Island. Their mean age was 28 years.

Group II represented individuals with partial control over their environment. These *Ss* were 40 male students from an all-male Catholic high school located on Long Island. The mean age was 17.8 years. *Ss* experienced partial freedom which was a function of parental and educational supervision with some amount of unsupervised activity.

Group III was comprised of individuals with the greatest degree of control over their own environments. These were 40 male undergraduates resident at C.W. Post College. The mean age was 20.5 years. These *Ss* were more removed from parental supervision than Group II. Class attendance is not mandatory, so that *Ss* were less subject to educational control. Dormitory regulations permitted *Ss* a 24-hour visiting privilege. It was the general concensus of the residents that drug restrictions were lax.

Apparatus

The Schier and Cattell Neuroticism Questionnaire (NSQ) is a standardized 40-item personality inventory which yields a neuroticism profile. Schier and Cattell (1961) report that the age factors does not affect scores in the NSQ. The present age differences between groups is then not a significant factor.

Procedure

The NSQ was administered while the *Ss* were in their natural environments. Each *S* was instructed to reply spontaneously to each question. To insure free responding, it was stressed that no name, addresses, or any information revealing any personal identity would be recorded. Only ages were recorded.

Ss were informed that they were being tested for a project on attitudes and opinions. The exact nature of the NSQ or of the study was not revealed.

Testing of prisoners was implemented by prison officials. *E* was not allowed personal contact with the prisoners.

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NSQ scores included: Neuroticism profile; anxiety; submissiveness (E); overprotection (I); and depressiveness (F).

Results

A comparison of the mean scores obtained for neuroticism, anxiety, E, F, and I, indicated that Group I registered the highest scores in all categories except I. Such comparisons can be observed from Table 1.

TABLE 1

Comparison of mean group scores for the NSQ

	Prison Group I	*Catholic High School Group II*	*College Residents Group III*
N	40	40	40
Neuroticism	40.9	36.1	36.8
I	8.9	8.5	9.4
F	8.4	7.9	6.5
E	10.9	9.4	10.4
Anxiety	12.6	10.3	10.6

A one-way analysis of variance was performed on the collected data. Table 2 represents a comparison of the observed levels of significance. Significance was observed on scores obtained for neuroticism and anxiety at $p < .01$.

TABLE 2

One-way analysis of variance computed for anxiety and neuroticism

Source	*df*	*F*	*P*
Neuroticism	$\frac{2}{117}$	1255.8	.01
Anxiety	$\frac{2}{117}$	473.4	.01
E	$\frac{2}{117}$	292	.05
F	$\frac{2}{117}$	228	.05
I	$\frac{2}{117}$	425	.05

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Independent sample t-tests were performed for neuroticism and anxiety scores. Table 3 shows comparisons. Group I had a significantly higher neuroticism index that Group II $p < .001$; and Group III $p < .0025$. Group I scored significantly higher for anxiety than Groups II and III, $p < .001$ and $p < .0045$, respectively. No significant contrast was observed between Groups II and III for any of the collected data.

TABLE 3

Comparison of independent-sample t-test values for neuroticism and anxiety

Groups	*t*	*df*	*p*
	Neuroticism		
I and II	2.5	78	.002
I and III	2.78	78	.005
	Anxiety		
Groups	*t*	*df*	*p*
I and II	2.5	78	.002
I and III	3.23	78	.009

Discussion

In an attempt to isolate the effects of control over an environment, the data indicates that neuroticism will significantly increase when there are full restrictions of freedom. In contradiction to Fromm's hypothesis that increased freedom produces higher neuroticism indices, it was observed that decreased control over the environment increases neuroticism levels.

An important observation stems from the apparent lack of significant differences found between Groups II and III. When *Ss* have at least partial control over their environments, the quantity of freedom does not seem to affect neuroticism and anxiety scores.

Note that anxiety scores were highest in all groups. In Group I the anxiety score was significantly higher than those in Groups II and III. Group I also had the significantly highest neuroticism score. Since neuroticism and anxiety were the only significant scores obtained (and anxiety scores were highest in all groups) then it may be inferred that anxiety is an important factor in determining the neuroticism score. Therefore, freedom

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affects neuroticism by increasing anxiety as a function of deprivation of control over the environment.

It should be noted that while the tested inmates had the highest neuroticism and anxiety scores, this does not suggest that they were "neurotic." A maximum score on the NSQ for neuroticism is 80, with a mean of 42.1. For anxiety the maximum score is 20, and a mean of 9.8.

The most important aspect observed from this study was the process by which freedom effects neuroticism levels. Lack of freedom increases the neuroticism index while maximized freedom shows no advantage over partial control over the environments.

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THE USE OF HERITABILITIES IN PERSONNEL SELECTION

VOLKMAR WEISS

In a number of practical problems it becomes necessary to predict the success of an individual over a range of five, ten, or fifteen years. The problem seems especially difficult in the case of children of five or ten years of age, for example, when we need to predict their adult stature, arm length, weight, or other variables which are of importance in athletics, skating, or in such artistic, educational, and professional specialities for which children and youngsters must be trained for ten years or more if they are to achieve their maximum potential performance.

Ideally we should have a single classification battery of measurements and tests (Horst, 1968), which (by means of differential weighting procedures according to the multiple correlations between criterion and predictor variables) would enable us to predict success in each of a variety of specialities. In order to calculate true final scores and to eliminate error variance of measurement, a second weighting procedure is necessary, such a procedure maximizes the heritability of the battery.

We note that an analogy exists between the mathematical models of psychological test theory and quantitative genetics, as well as between the parameters derived from these models. In classical test theory (Horst, 1968), the following linear model is assumed:

$$X = T + E,$$

where X is the observed test score of an individual, T is the true score, and E is the error of measurement. In quantitative genetic theory (Li, 1975), a similar model is assumed:

$$P = G + E,$$

where P is the observed phenotypic value, G is the genotypic value, and E is the environmental deviation (including error of measurement). The reliability of a test or an anthropometric measurement is the regression of true scores on observed scores or the correlation between performances of parallel forms of a test. The "heritability in the broad sense" is the

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regression of genotypic values on phenotypic values or the correlation between members of identical twin pairs. Therefore, test-retest-reliability, which, as we know, is high in standardized anthropometric measurement, provides an upper-bound estimate of heritability.

If there is a time-span of one, two, or even ten years between test and retest, we do not refer to test-retest-reliability, but to the longitudinal correlation between the two measurements (Bloom, 1964). Evidently, in long range prediction it is better to weight the variables with these longitudinal correlations rather than with the test-retest-reliabilities at the starting time of prediction. Although longitudinal correlations over ten years can only be measured in longitudinal studies lasting ten years, new developments, new tests, and new measurements often require quicker results. From the analogy between test theory and quantitative genetics we can conclude that longitudinal correlation and "heritability in the broad sense" are equivalent expressions for reliability in the long run. The difference between them, however, is that heritabilities can be measured immediately, without longitudinal study.

Heritabilities are not natural constants for their quantitative values, but depend upon the population, gene frequencies, age of probands, and other factors. The heritabilities of anthropometric traits reach a mode at an age of ten. During puberty the heritabilities decrease before rising again. In order to construct indexes for personnel selection, we therefore decided to measure the heritabilities of twins at the age of ten.

In 1974 and 1975 a representative sample of 3000 pairs of twin was measured in East Germany and tested and the following results were obtained (Weiss, 1977): The heritability of stature was .89, of weight .88, of the 60 meters run .85, of long jump .74, of cricket-ball throw .54, of push-up .85, of hop jump .66, of shot throw .71, and of the endurance run lasting 7 minutes .93 — the latter a surprisingly high correlation. We were also surprised to find that the high heritability of weight (.88) was equivalent to that of stature. This must be seen in the light of the high level of general health and nutrition in the German Democratic Republic.

From this information about heritabilities and the matrix of intercorrelations, the so-called heritability index (Heidhues and Henderson, 1962: Weiss, 1976) can be calculated:

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$$I = a_1 h_1 x_1 + a_2 h_2 x_2 + \ldots + a_n h_n x_n$$

where $x_1, \ldots x_n$ are the measured phenotypic scores, $h_1, \ldots, h_n$ are the heritabilities, and $a_1, \ldots, a_n$ are regression weights. Feldman and Lewontin (1975) are in the wrong when they write "heritability . . . is nearly equivalent to no information at all for any serious problem of human genetics" and that "heritability has no prescriptive power." For centuries the breeder has found that narrow heritability is important, because narrow heritability determines the speed with which desired changes in a phenotypic measure can be produced by artificial selection.

While selective breeding is not the aim of human genetics, personnel selection raises the problem of long range prediction. For this purpose broad heritability provides an ideal estimate to weight individual test scores by their reliability in the long run (Rygula, 1975). Generally it is found that the higher the heritability, the higher the predictive power of the test. Environmental correlations, such as commonly exist in human societies and often enhance the effect of calculated heritabilities, are no hindrance to the practical application of these heritabilities (Weiss, 1978).

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UNDERSTANDING HUMAN SOCIAL EVOLUTION: THE CONTROVERSY BETWEEN KINSHIP AND SOCIAL MATERIALISM

ROGER PEARSON

In contemporary American academic circles, the study of human social evolution has tended to be heavily influenced by the concept of social materialism as reflected in the work of writers such as M. D. Sahlins (1960), Gerhard Lenski (1966), M. R. Fried (1967), and Elman R. Service (1971). In accepting this influence, they have tended to concentrate heavily upon economic factors and the role of class formation and class competition, attempting to extend concepts of class into the study of simple societies which predate, in simplicity, any of the complex societies with which the terms 'class' is correctly associated. Indeed, this fixation with social inequality has tended to cause some writers to attempt to interpret the role of kinship and the nature of kinship societies in terms of emergent social inequality, emergent capitalism and emergent class structure – thus narrowing the study of anthropology to the restricted viewpoints of historical materialist theory.

The basic hypothesis of "social materialism" has much to commend it as *one* viewpoint from which to look at the problem of human social evolution, but it is by no means the single, all-embracing approach some authors assume it to be. In our opinion, the traditional anthropological emphasis upon kinship, with its basic biological, emotive and cultural implications, remains the most significant single approach to the analysis of human social evolution.

Significance of the Family

While nonhuman primates tend to respond to sexual stimuli with very direct and largely unrestrained biological responses, human societies heavily restrict sexual behavior according to elaborate conventions, and it has been suggested that under these circumstances much of the emotional energy associated with sex tends to be sublimated into other activities. But the practice of pair-bonding leads among humans to something even more important than this. It leads to the institutionalization of the *family*.

Anthropologists and sociologists still debate the ideal definition of the term *family*, but all agree that in some way

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the idea of the family combines the idea of pair-bonding with the concept of the *household*, a cooperating economic unit. The evolutionary history of the family as a social institution makes this clear. The pair-bond is a form of cooperation which developed because it promoted the survival chances of the offspring. The essence of the family is rooted in the formation of a pair-bond between adult males and females who cooperate to ensure not only their own survival but more particularly the survival of their offspring – to ensure, in broader evolutionary terms, the genetic survival of the lineage. The family may therefore best be defined as a social group comprising one or more males linked by a socially recognized set of mutual obligations and privileges to one or more females, together with their offspring, who face the problem of survival as a joint enterprise.

The human family is itself but the basic unit in a more complex network of community ties. As memory developed among our hominid forebears, so the patterns of behavior learned in infancy tended to be preserved into adulthood. Baboon infants lose their special relations with their mother as they grow into adulthood; and of course they know no father. On the other hand, chimpanzees, which may be equated with a Ramapithecine level of behavior, may reveal a partial extension of infant patterns of behavior into adulthood in the apparent development of *incest prohibitions* that prevent the adult male from attempting sexual relations with his own mother. The further development of memory among our own hominid ancestors resulted in a still greater projection of attitudes learned during childhood into adulthood.

Thus the significant evolution of speech among hominids would tend to promote the conventionalization of patterns of learned behavior, not only through the exchange of ideas but also by the invention of fixed labels for particular individuals. Labels such as "mother," "father," "sister," and "brother" which are learned in infancy continue to be used in adulthood, and thus perpetuate into adulthood the patterns of affection, trust, and mutual obligation acquired during infancy. As adults, human males and females continue to be guided by the social rules learned in infancy. In contrast to most nonhuman primate societies, in which old age incapacitates individuals in the struggle for dominance and submission,

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human parents may retain the loyalty of their children even in sickness and senility.

Patterns of affection and obligation develop between siblings as well as between parents and children, and as brothers and sisters grow up to marry and establish their own families, so eventually the entire community will tend to become interlaced by a pattern of learned roles, attitudes, and statuses. A man's brother becomes, in the course of time, an uncle to his children, and his brother's children become his own sons' cousins. In this way not only did pair-bonding produce the family, but at the human level it also produced the concept of *kinship*. It effectively replaced intragroup conflict by intragroup cooperation, substituting patterns of mutual obligations for dominance and submission as the basis of social order. Henceforth every hominid born into the group acquired at birth a set of privileges and obligations, a recognized niche in an integrated social system. Kinship had evolutionary value in that it replaced the principle of dominance, rooted in conflict, with an ascriptive system in which social order was ensured by a pattern of learned behavior – the rules and obligations implicit in kinship ties – acquired at birth, thereby transforming the hominid band into a more efficient team of cooperating individuals who faced the problem of survival as a joint venture. Kinship was a cultural innovation that had survival value, and those groups which first developed efficient kinship systems had superior survival chances over those that lagged in this respect.

Held together by a network of kinship privileges and obligations, earlier human societies saw kinship not as we see it. In kinship based societies kinship is not just another category of social behavior in the sense of political, religious, or economic relations. In such societies kinship implies every other kind of relationship known to society, including economic and political relations. In such societies kinship is the bond that holds all the members of the society together, and defines their behavior and relationships completely. Traditional kinship obligations and privileges define the limits of all possible relationships between the members of the community.

Only when society becomes larger do we begin to find distinctive political institutions that are not an integral part of the kinship system, which provide alternative methods

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or socially approved processes for defining the norms of acceptable conduct, for allocating offices of leadership, for settling disputes, and for organizing group defense. In earlier human societies the kinship system took care of all this. Only at a higher level of social complexity do distinctive nonkinship political institutions begin to emerge. Government consequently emerges unheralded as local groups begin to grow in complexity, initially through an elaboration of the kinship system, and only later by the inauguration of political institutions separate from the kinship structure.

Endogamous Bands

The analogy of known primate societies, the evidence of archeology, and the study of surviving hunting and gathering societies all suggest that man's primordial hominid ancestors lived in small territorially based communities long before they had evolved to *Homo sapiens* status. These early hominid territorial groups are known as *bands*, to distinguish them from the nonhuman primate *troops* from which they probably evolved and from which they differ because the hominid habit of pair-bonding and the resultant family pattern of social organization involves food sharing and a division of labor between the sexes.

At the simplest level these small human bands (1) each represented a distinct Mendelian population, being primarily inbreeding and hence largely isolated from a genetic point of view, like nonhuman primate troops. Such predominantly hominid territorial groups are known as *Endogamous Bands*.

Each endogamous band is autonomous in its own territory, and roams around this territory more or less continuously in search of food. Although divided into families, each individual is linked to every other individual by ties of kinship and the bonds of close companionship. The principle of *incest* normally operates to prevent sexual relations between members of the same family unit, but the simple fact of distance causes the members of these bands to find a mate from another family within the band.

As social materialists truly indicate, band type societies

(1) Elman R. Service in *Primitive Social Organization* (New York: Random House, Inc., 1971) fails to recognize the evolutionary relation between primate *troops* and human *bands*, resulting from the emergence of pair-bonding and kinship.

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may be described as *acephalous*. (2) They generally lack headmen or leaders. A person who shows particular talent may be listened to with respect, but each adult male, as the head of his own nuclear family, is essentially a free agent in his own right, bound only by the cultural traditions which oblige him to show loyalty and diffidence to his fellows, particularly to those who are senior to him in the kinship system. There is no sense of authoritative power in a band type of society in the sense that authority implies coercive power vested in any individual by the members of the group. Nevertheless, the character of the band is not to be likened with modern socialism, but is more akin to the sharing of resources within a family. The band is a primary face-to-face group, linked by kinship ties. Its members, like a family, are bound together by the common need to cooperate to survive.

Few examples of truly endogamous band-type societies have survived into historical times. But since nonhuman primate troops generally inbreed, it seems justifiable to suppose that at some earlier stage in the history of hominid social evolution predominantly endogamous bands were the rule rather than the exception.

Exogamous Bands

We may note here that baboon troops frequently increase in numbers to the extent that they are forced to divide into two distinct troops, sending off a colony to occupy a neighboring territory. Human bands may also become too large for the territory they occupy and send off a colony to settle a new territory. But after baboon troops divide, they lose contact with each other, and even if the two troops subsequently meet at a common waterhole, they show no evidence of particular friendship or recognition. Gorillas and chimpanzees, by contrast, show signs of recognizing former associates; and at the human level, kinsmen and kinship ties are definitely remembered. Consequently when a human band sends off a detachment to colonize a neighboring territory the kinship ties may be preserved, and the two groups may retain any preexisting attitudes of sympathy and kinship. When the

(2) See Morton H. Fried, *The Evolution of Political Society* (New York: Random House, Inc., 1967), on "equalitarian societies."

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members of the two groups meet again, they will then do so with confidence, because they are meeting cousins and kinsmen who share a common language and a common folk tradition with them.

In such cases there will be no barrier to the exchange of young women as wives for each other's sons, and should inter-band marriages take place, these reinforce the mutual ties between the bands for yet another generation. The exchange of womenfolk as wives serves to prevent the bands from drifting apart genetically, linguistically, and culturally, and inter-marriage keeps them united in every way except economically. As the principle of incest operates, it may even become the rule to find a wife from a related and friendly neighboring group rather than from within one's own group, thereby reducing the possibility of tension and conflict arising out of rivalry over women within each separate territorial band. As among the Arunta of Australia, the result is a group of local bands each independent and autonomous in its own territory, but all held together by a common language, a common culture, and even by a common gene pool. Although the members of these bands may know nothing about genetics, they will know that they look alike, that they share common folk-memories or traditions, and that they are recognizably different from the members of alien bands speaking alien languages, whom they will treat with suspicion.

Interbreeding exogamous bands feel a sympathy for each other, not only because of the bonds of intermittent companionship, language, and culture that unite them, but also because regular intermarriage binds them tightly with kinship ties. In consequence, the members of a group of exogamous bands may sometimes unite to aid each other, as when under the pressure of an expanding population the territory of a related band is subjected to infiltration by newcomers. The members of band-type societies do not always fight to defend their territories. An Eskimo band whose territory is invaded by rival hunters usually pack their belongings and move on to a less crowded area rather than attempt to dispute against a more formidable group. But if the new territory is marginal land, providing less food, a bad year may eliminate the band that was ousted from the better territory. Because a group of co-operating exogamous bands constitutes a considerably more

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formidable body than a single endogamous band, the latter inevitably give way to exogamous bands. Only a few endogamous band-type societies have survived into this century, and these are mostly located, like the Yahgan, in the more remote corners of the earth.

Clans

In the course of time exogamous bands tend to emphasize kinship rather than the concept of contiguity. Territoriality is the main principle behind the band, even though internal cooperation is ensured by kinship, but the regularization of interband marriages will emphasize the role of kinship to the point that the concept of kinship eventually replaces that of territoriality in social significance. When this happens the members of an exogamous band will think of themselves as the members of a specific and identifiable kinship group, such as a clan.

By definition, a *clan* is a group of people who believe themselves to be bound to each other by reciprocal privileges and obligations by virtue of descent from a common ancestor, real or imaginary. Clans always have distinguishing names, and this may be the name of a patriarchal hero-founder. Thus, if a man called Donald were to lead his family to settle a new territory, it is possible that — as in the Highlands of Scotland — the descendants of this hero-father called Donald may call themselves "MacDonalds," for *Mac* means "son" (or descendant) of a term which also by implication includes great-grandsons and all subsequent descendants. The Irish *O'* has the same meaning, an "O'Reilly" being a "grandson" (or descendant) of the great clanfounder, the hero-leader Reilly. All subsequent members of the band might then call themselves "MacDonalds" or "O'Reillys" as the case may be.

In the course of time the MacDonalds may be successful in their new location and proliferate, sending off a new colony to settle fresh land adjacent to the parent territory. Only one or two families may be involved, and if the leader of this colony is named "Millan'" the succeeding generations may call themselves "MacMillans." Because the MacMillans and the MacDonalds share the same heritage of folklore, language, and culture, and because they will remember that they are related to each other, they will feel safe with each other when they

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meet on the border, and probably intermarry exogamously, MacDonald men marrying MacMillan women and vice versa. Many variations on this hypothetical pattern of naming and clan organization may arise, such as the totemistic system common to so many simple clan-based societies.

Tribes

The concept of the tribe is one of the most disputed subjects in anthropology. (3) Some writers accept a group of intermarrying exogamous bands as a tribe, provided that the members think of themselves as a kin-related group and share a common language, culture, and contiguous set of territories. They stress that a band is essentially a territorial unit, whereas the principle of the clan and tribe are rooted in the principle of kinship rather than that of territory. It would seem reasonable, however, to distinguish between bands, clans and tribes more clearly than this, by enquiring to what extent a degree of political integration may exist. Bands are essentially autonomous units; but in a political sense a tribe always has some established formula for coordinating the relationship between the member clans or other kinship units. When territorially segregated clans that cooperate regularly establish a clan council to exercise some kind of cohesive unity between the different territories or clans, they become a tribe. Such a council of clan or tribal elders may or may not elect a permanent chieftain, and may not necessarily have any coercive power; but even if it functions in a consultative sense only, once some kind of supraband coordinating mechanism exists, we have a politically cohesive tribal society.

The earliest tribal councils were still rooted in the concept of kinship. Thus among the Bantu tribes of Rhodesia, all government is essentially familistic at the village level. When an issue is to be decided, the male heads of families will meet to discuss the matter under the "chairmanship" of the village headman, a position which is usually hereditary, being equivalent to a clan or lineage chief. All decisions are taken unanimously. The idea of a majority group dominating a sulking minority is objectionable in a tight kin group. Such debates may take several days, but in the end, as the mood of the meeting

(3) Fried, pp. 154f.

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becomes more clear, the minority will eventually withdraw any objections they may have had and agree with the majority element, putting on as good a face as possible. In such debates, however, the more senior, experienced, and respected family heads may wield more influence than the younger ones, and the better orators often have considerable influence. When a unanimous village opinion has been reached, the headman and several other villagers will attend a similar meeting of village representatives at the home of the district chief, and the process is repeated. Eventually the district chiefs attend a meeting at the residence of the tribal chieftain, when a final and binding resolution is passed.

Tribal societies can be classified according to two major principles. The obvious way in which a tribe can come into existence is by an increase in population, with a resultant expansion in area of settlement, which causes a single band to grow into a number of exogamous bands. As these become separate intermarrying clans, linked by a tribal council of clan chiefs and possibly by a tribal chieftain, we have what has been called a *classical segmentary tribe* — one that has come into existence in a classical pattern of expansion in numbers and territory, resulting in a segmentation of the original group into a number of intermarrying clans.

Such classical segmentary tribes are often reasonably equalitarian because all members share common ancestors, but tribes can also result from an amalgamation of different peoples. A population may expand and seize neighboring territories without eliminating the indigenous population. If the victorious tribe subordinates the defeated peoples, treating them as slaves or inferiors and refusing to intermarry with them, a new situation will develop. While admitting the conquered people as inferior clans under their political hegemony, the victors may still keep the descendants of the conquered clans in subjugation. Such units, comprising a politically unequal agglomeration of various nonintermarrying clans of diverse origins and diverse status, differ markedly from classical segmentary tribes, and may be described as *composite tribal societies*.

Nations

Such is the pressure of populations on resources and terri-

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tories, that not only have band type societies given way to tribes, but some tribes have multiplied and expanded at the expense of others, absorbing or dispersing the remnants of the less powerful peoples. In such cases the enlarged and more widely dispersed population may itself become subdivided into a number of related and cooperating tribal units. Where external pressures reinforce the internal bonds of loyalty to ensure cooperation under the prestige of a common kinship leader, the term *nation* may be applied.

The relationship between the nation and the tribe is apparent even etymologically, for our word *tribe* comes to us from the Latin *tribus*, indicating a third part of a nation. Nations reflect the kinship ideal at its maximum political and territorial extension. Although effective government may become bureaucratic rather than hereditary in principle and the nation may be held together by a variety of economic, political, and social forms, in the thoughts of its nationals a nation is still essentially a large kinship grouping, representing a particular ethnic type with a distinct gene pool, and regarding all its members as kinsmen who speak the same language and share a common cultural, historical, and linguistic heritage.

Thus national government in early historic Europe mostly had its roots in the collective village settlement, orginally comprising a related group of families, the members of which owned the land communally. The town of Hastings in England, for example, was originally called *Haest-inga* meaning simply the *inga* or descendants of Haest. The heads of families in each village were regarded as equals, but a village chief was normally chosen for life from among the eligible members of one family which was regarded as senior to the others. In the Slavic *zadruga* the heads of families assembled after work every day to discuss social issues, under the chairmanship of the village chief. When a tribal decision had to be made, the headmen from each village would attend a tribal council where he represented his kinsmen under the chairmanship of a tribal chieftain. (4) In the course of time, as larger political units came into being, this elementary system of kinship representation became

(4) See also Paul Kirchoff, "The Principles of Clanship in Human Society," in M. F. Fried (ed.), *Readings in Anthropology*; Vol. II (New York: Thomas Y. Crowell Company, 1968).

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transformed into a three-tier political structure comprising a hereditary national leader or *King*; a *Council of Nobles* representing the local clan or tribal chieftains who met periodically with the king as an advisory body, and a *General Assembly* of all the adult freemen who, being heads of households, were entitled to be consulted on important matters. This ancient system is still reflected in the British tradition of a King; a House of Lords, comprising the hereditary nobles; and a House of Commons, representing the freemen. Only in the last century was political representation in Britain extended to women and other adults who were not heads of households.

It is significant that the English word *king* derives from the Anglo-Saxon *cyning*, literally meaning a "man of the kin," in the sense of the purest descendant from the original tribal founder and therefore the "father" of the living family of descendants. When an hereditary nobility and royalty emerge we talk of a *ritually stratified society*, (5) for hereditary positions of leadership always tend to be reinforced by ritual ceremonial and frequently also by magicoreligious sanctions. Kings will be crowned with solemn ceremony and sacrifices may be offered to royal ancestors. The existence of such ritual stratification in a tribal society does not necessarily mean that the hereditary office-holders exercise arbitrary authority. Kings were not necessarily "people who order other people around," as a university undergraduate once told the author. On the contrary, traditional kings *reigned* rather than *ruled*. As symbols of tribal and national blood unity, the authority of kings was generally heavily circumscribed by custom. So long as kinship remained the basis of society, no king might impose any decision on his kinsmen that may be regarded as unjust according to tradition and the dictates of the national culture. Prior to the coming of feudalism, kings were customarily loved and revered as symbols of the unity of the nation-family, the people feeling that the kings belonged to them, rather than the reverse.

Conclusion

Thus, the social evolution of human societies from the level of small hominid bands to the sophistication of kinship-based

(5) See J. G. Frazer, *The Magical Origin of Kings* (London: Dawson of Pall Mall, 1968), for further reading on the origins of kingship.

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tribal societies is still but poorly understood by cultural anthropologists, as also the role of kinship ideology in the formation of nations.

In terms of this brief survey, it seems to us that the inability of social materialism to explain how tribes and nations evolved out of band-type societies is particularly revealed by the popular fallacies still propagated with regard to the evolution of endogamous bands into exogamous bands. Without reason or thought it is too often implied that two separate endogamous bands one day simply began to intermarry and then "invented" a rigid rule of exogamy to maintain the relationship. Our above explanation is surely more rational, and in harmony with what we know of kinship and the power of kinship in simpler, less confused societies than our own. The only explanation one can find for those who assume that exogamous, intermarrying bands would normally form such a relationship "by chance," rather than as a direct result of pre-existing kinship ties, is that the proponents of such an idea are projecting their own political philosophies and experiences as members of complex western urban societies into their analysis of simple and predominantly kinship-based societies. In so doing they make a basic methodological error, but one which nevertheless appears to be at the root of the prevailing misinterpretation of the forces behind the evolution of human society.

As we stated at the outset, it appears that the social materialism of Elman R. Service's *Primitive Social Organization* (1971) tends to dominate current concepts of social evolution. In short, the emphasis is placed upon economic factors and the transition from equalitarian to hierarchical societies. It is our contention here that social materialism overlooks the most essential aspect of human social evolution from the band to the tribe. Just as kinship is the basis of tribal organization, so the evolution of human society to the tribal level is best comprehended in terms of kinship evolution from simple pair-bonding to the complexity of clan and tribal system. Social materialism also fails to comprehend the normative and ideological factors operating behind the evolution of tribal into national societies, while almost totally ignoring the strong persistence of kinship factors in feudal societies — a rich topic which deserves separate treatment in its own right.

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THE LINKS BETWEEN FIRE WORSHIP AND ANCESTOR WORSHIP: A SPECULATIVE ESSAY

J. W. JAMIESON

Even the most cursory study of cults of the dead reveals a close relationship between the fire on the family hearth and ancestor worship. This is not surprising for the roots of both are to be found in man's ancient past. To people who live in small and essentially isolated communities the fire on the family hearth is a center of communal life. At the same time the members of such societies are almost invariably bound to each other by strong ties of family and kinship. Under such circumstances, the ghosts and spirits of the ancestors loom large in their religious thought. While the recognition of family ghosts and the development of rites in honor of such beings becomes one of the dominant features of life, rituals associated with the fire around which the family gather with daily regularity also play a magico-religious role, and it is therefore logical to expect a connection between fire worship and ancestor worship.

Early Attitudes towards Fire

From far back in human prehistory, evolving sub-men had experience of wild fires, and as man's intelligence grew so must his respect for fire have grown. The spontaneous combustion of a bush fire, sparked off mysteriously by the dramatic forces of a thunderstorm, as a flash of lightning brightened the entire sky and set fire to a tree, could only be explained in terms of the supernatural. Such bush fires set up a chain of terrifyingly supernatural activity which seemed to be self-generating; and early human observers must have asked – what is fire; living, or non-living? Although infant fires, taken from parent fires and fed with sufficient food, may grow to adulthood, fire knows no old age and no inevitable mortality; it seems capable of eternal life provided it receives the nourishment that it needs. Certainly it possesses the ability to regenerate itself – writhing, roaring and devouring just like a living thing – and yet when it disappears, it leaves only a trail of destruction as evidence of its former presence. No corporeal body survives the death of fire. Indeed, fire seemed to be a supernatural,

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ghost-like being without substance or truly physical form — something that a man could pass his hand through, but in so doing, might suffer pain and even serious injury.

Our forebears also discovered that fire could be used in many ways — it could be used to harden the wooden ends of spears, it provided protection against wild animals at night, it could also be used to burn the hair off slaughtered meat, and in the course of time it came to be used to roast food to make it more edible. In other words, fire had a score or more of domestic purposes, so that it became a central factor in the daily life of the family community. So important was fire, that ancient legends often say that it came from the Gods, like the Promethean legend of the Greeks, which claimed that Prometheus stole the sacred flame from heaven in a hollow tube.

The first human bands which used fire did not know how to make it, and had to "catch it wild." Indeed, at the turn of the present century, there were still some Australian aboriginals who did not know how to summon fire to life at will. In consequence, the glowing embers had to be carried around with the band as it migrated daily in search of food, and under such circumstances a particularly close association developed between the primitive community and its treasured fire. While primitive Tasmanians carefully preserved the sacred flame, and the Ainu and Koreans kept perpetual fires burning in their homes, the members of many highly sophisticated societies have preserved an eternal flame as a part of their religious tradition long after they had learned the secret of making fire at will.

In addition to its usefulness and ritual significance, fire also influenced psychological power over its user. Those of the readers who may remember having camped out in the open woods as children, will remember also the intense emotional aura which emanates from the camp fire at night, when someone blows the embers into life, and the fire illuminates the faces of those who sit expectantly around it. Recounting tales of the past — the well-loved legends heard many time before — primitive men must have experienced the same emotional thrill of "togetherness." The flames gave not only light and warmth, but also protection from the dangers that lurked in the dark backcloth which engulfed all beyond the small circle. No setting

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could be better calculated to engender a sense of group identification and family cohesion than that of the camp fire in the darkness of the wilderness. Repeated evenings around the fire, from infancy to old age, would reinforce with emotion the bonds of loyalty and intimacy which unite all such primitive human bands.

Reverence for the Hearth Fire

To these small wandering groups of hunters and food-gatherers, the camp fire must have symbolized the solidarity of the kinship community: long before the house was invented, the hearth fire must have been regarded as the symbol of family unity and continuity. From childhood to old age the hearth fire was the daily gathering place – the central shrine of group unity – into whose semi-magical circle new members were introduced with each generation, and from which older members disappeared with death. The fire on the hearth, the only home that men knew before they constructed buildings, became a sacred symbol – in truly Durkheimian terminology – of the continuity of the family from generation to generation; it became the symbol of all group life and of all group loyalties. Thus among the Mara peoples of Australia, ritual requires that new fires must be created spontaneously with the use of fire sticks by members of one kinship society who then present it to the corresponding society, thereby symbolizing the sacred unity of the larger social group. Similarly, young Australian men are ceremonially presented with fire sticks by their future mother-in-law, at the time of their initiation rituals, as a symbol of their impending "home-making" responsibilities.

As food gatherers, men wandered daily in search of their food, carrying their few belongings with them on their backs or at best in wicker handbags, but as these same men and their descendants slowly learned the arts of agriculture, the importance of the hearth fire did not diminish. Although settled villagers do not need fire to protect them from wild animals, the walls which they raise around their fires seem almost to enshrine the sacred flame, investing it with a new familistic privacy and personal uniqueness. When men settled down to village life, therefore, the hearth was elevated to the very center of a much more complex domestic system which

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still revolved around the fire as the vital, living and supernaturally-endowed shrine of household life. Thus we learn that among the Celts of Ireland, into living memory, there could be no greater dishonor to a man and his kin than to enter his house and abuse both the living and the dead, stamping out the living flame and kicking the embers of the hearth fire in all directions, thus impugning the integrity of the entire lineage. Insults and even violence in the open field or on the open road were one thing, but an insult laid at the very shrine of the family, scattering the symbols of inter-generational continuity, went far beyond physical abuse, carrying the injury into the realm of the religious and sacred.

The Hearth Fire and Ancestor Worship

So also among the Slavic peasantry of Russia, the hearth fire was regarded as a symbol of the continuity of the family. No fire would be lit in a house, except from the embers brought from the old household, and should a house change hands, the old fire which burned must perforce be extinguished as the outgoing occupants left, so that the incoming family might set its own fire on the new hearth. The Russian peasant even conceptualized the hearth fire as an ancestral spirit in itself, calling it "little grandfather," in the same way that singular terms are frequently used to designate what may formerly have been thought of collectively as representing all the ancestral "grandfathers," great grandfathers, and ancestral forebears into the mists of time past. When moving house, the fire from the old hearth was reverently raked into a jar that was carried along with the other possessions to the new home. There it was emptied out onto the new hearth, the embers were revived, and the first flame to show itself was saluted with the words "welcome Grandfather." Like other Indo-European peoples, pre-Christian Russians, Prussians and Lithuanians kept the sacred hearth fire burning constantly, never allowing it to become extinguished, for fear that this might augur the extinction of the family.

Family Fire Rituals

Because fire thus became the sacred symbol of the group, more sophisticated societies frequently believed that it should be fed only with "pure" materials, so that nothing profane

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or vulgar might be allowed to taint the sacred flame; and the Parsees feed their sacred fires only with sandalwood, while even among simpler peoples the idea of spitting into the family hearth is frequently regarded as sacriligious. With increasing sophistication, however, symbolic hearth fires appear preserved on sacred tables or "altars," the purpose of which may have been to separate them from contact with the profane dirt of the ground. Thus with the Romans of Republican era, the sacred hearth fire became but a symbolic flame, set on the family altar in the *atrium*, where it was fed with only the purest of substances. Here it played a central role in all family rituals, and on marriage the new bride would be carried over the threshold of the patriarchal household by her husband, so that her feet would not touch the floor until she could stand before the altar and offer food to the family hearthfire of her new husband. When a new Roman household was established, it was the wife who lit the new hearth flame, symbolizing the biological fact that it was she who would provide the family with the posterity that it would need. So, too, in Aryan India, the women of the family were dedicated to the god Agni, (whose Indian name is etymologically related to the Latin *Ignis* and to our words "ignition" and "ignite") in his role as the spirit of the family hearth fire, and the crucial moment in a Hindu wedding is reached when the end of the bride's saree is intertwined with the groom's clothing and both walk in solemn unison around a symbolic hearth fire.

Not only was the hearth fire the symbol of the family, but the early Romans conceived of their nation as a group of related families, which were forbidden by endogamous rules of connubium from marrying outside certain recognized kinship limits, and the Roman state had its own hearth fire, dedicated to the same goddess Vesta who guarded over the family hearth. The state hearth fire was tended by "vestal" virgins whose duty it was to keep the flame burning perpetually, and Frazer suggested that in proto-Indo-European society it may have been the duty of the unmarried daughters of the house to tend the fire, and that in pre-Republican Latin society the daughters of the king may therefore have had the duty of tending the state fire, for the king in early Indo-European society symbolized always the concept of social unity and national continuity, being the *cyning* or "father" of the larger, national, kinship

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group. A similar sacred state fire was maintained by the Incas, at Cuzco in distant Peru, which like the Roman fire was tended by unmarried women – indeed, so closely did Inca society reflect many of the customs of ancient Rome that the first Spanish explorers reported that they had found a new Rome in the Americas.

Among the Achaean or Homeric Greeks, we again find respect for the fire on the family hearth, and the Iliad defines an outcaste as "one without phratry, hearth or rights," these three qualities being in practice inseparably linked to each other (II. IX, 63). The family fire occupied a central position in the Greek *megaron* house, set in a circular hearth, often surrounded by a circle of columns to give it more dignity, and the symbolic significance of the Greek hearth is evidenced by the fact that a suppliant might seek to seat himself among the ashes of the fire, in order to present his request to the head of the household, for by so doing he invoked the hospitality and generosity of the entire lineage, including the ancestors, thereby virtually blackmailing the living householder into granting his prayer.

Fire and Sacrifice

Another characteristic of fire ritual also links fireworship to ancestor worship – that is the sacrificial ritual of the "communion" and the "burnt offering," so characteristic of the ancient Semites in particular. Even in primitive society, the hearth fire must have been closely associated with the common meal. Non-human primates do not share their food, and in the promiscuous communes of the baboon world there is no food-sharing. Food-sharing develops only with the emergence of family and kinship ties, and serves to bind the human group more closely together. In many primitive kinship-ordered societies, every member of every kin group has, by custom, his own entitlement to a specific portion of the kill, dependent upon his relationship with the head of the group or the hunter who slays the animal. But when the hearth fire is used to cook the shared meal, then the association between fire and the communal meal will also serve to reinforce the sacredness of the family hearth. In addition, some of the odour and essence of the meal is transported up into the heavens with the rising flames, and it takes but a little imagination for a people who

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believe in the survival of the spirit after death to assume that some of the essence that is consumed in the flames will eventually reach the nostrils of the ancestral spirits. The act of cooking the meal for the living may thus be assumed to provide nourishment for the ghosts of the dead also, who are thereby deemed to participate with the living in the common meal that they used to share with them during life, and the concept of "communion" between the living and the dead is strengthened by these "burnt offerings." Through fire, every meal becomes in effect a sacrifice, with the living partaking of the corporeal body of the food, and the dead receiving the spiritual essence.

Powers of Purification

Fire also developed another symbolic meaning, which is less directly related to the concept of ancestor worship. Because fire had the power to salve wounds, to destroy putrefying matter, and to postpone the decay of cooked food, it was commonly believed to possess purificatory powers. Fire was thus frequently associated with the removal of moral sin and guilt. It protected the home against evil thoughts and deeds, it drove away evil spirits as it drove away predatory animals that threatened primitive men in their open encampments, and it provided light – always associated with moral virtue. Fire became the symbol of goodness and truth in opposition to the forces of evil, who were associated with darkness, and while the Calabrians nipped the flame of a candle when swearing an oath, to prove the purity of their intentions, a wide variety of rites of purification and ordeals by fire developed, which would punish those who were sinful or guilty and leave the honest unharmed. So the dead might pass through fire in the afterlife, to cleanse the soul from evil – although among the Christians hell-fire became regarded as a form of torture and punishment rather than a simple purificatory rite. Yet even Christian sinners were burned at the stake in order to purify their souls so that they might be accepted into heaven, and the remarkable custom of auto-da-fe was also essentially a purificatory ritual.

Zoroastrian Fire Worship

The purifying quality of fire seems to be a characteristic

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which must be regarded as distinct from, although not in opposition to, the familistic character of the fire on the communal hearth – though in both the fire is the symbol of purity, integrity and honesty. In Zoroastrianism, especially, fire worship tends to have become re-directed away from a simple familistic origin, which it is assumed to have had among the pre-Zoroastrian Iranians, to acquire a greater significance as an elemental and purificatory deity or near-deity. Thus the Zoroastrian fire-worshippers emphasized the eternal, infinitely divine nature of fire, seeing it as an earthly form of heavenly light; and elevating it far above the realm of human loves and human spiritual aspirations, ceased to consign the bodies of their dead to funeral pyres, as their forebears had done, and instead demanded that no corpse should ever be brought near to the sacred altar flame, for fear of contaminating its purity.

But while the Zoroastrian association of fire with moral purity led them to construct special fire temples which were not directly linked to the worship of ancestors, they still honored the hearth fire; and the family fire, like marriage, remained sacred to them. Indeed, Zoroastrians still believed that the ancestral spirits were directly connected to the fire on the family hearth, returning to the earth to visit their descendants at the calendrical festival of Farvadin. Parsee fireworshippers, the sole suriving followers of Zoroastrianism in the contemporary world, are still among the most familistic of societies, and in accordance with the ancient Persian custom, regard it as a religious duty to marry the closest possible kin.

Distinction between Elemental Fire and Hearth Fire

Such variants as the Persian worship of fire as a symbol of purity and the Semitic use of fire for the transportation of burnt offerings to the spirits of the dead contribute only indirectly to the familistic tradition of the hearth fire and the worship of ancestors, but do not conflict with it. Nevertheless, the distinction between the hearth fire and the concept of fire as an elemental force in itself should not be overlooked, and the logical distinction between the two becomes more apparent when we remember that the Romans distinguished between Vesta, the Goddess of the hearth

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fire, and Vulcan, the god of natural fire. In the same way that the nature gods had a different origin from the *manes* or ancestral spirits, as Wilhelm Schmidt showed us, so elemental Fire, with its ally the wind god, was an essentially different concept from the hearth fire which symbolized kinship continuity. While the hearth fire was inherently bound to the concept of ancestral spirits, the worship of Vulcan or Ahura Mazda although often closely intervowen with ancestor worship, logically remains a function of nature worship. Nevertheless, it is perhaps no accident that on the occasion of the Hindu *Diwali* "festival of lights," hundreds of small candles are lit to honor the ancestral spirits who are returning to visit their ancestors on this occasion, and even as a symbol of natural forces, there is an essential harmony between the flickering flame and the temporal residence of the human spirit on this earth — both of which can be snubbed out with ease and all too astonishing rapidity. Fire as an elemental force of nature, and the fire which illuminates the family hearth and symbolizes family continuity and the presence of ancestral spirits, both reflect in their semi-supernatural character the same emotive qualities which we readily associate with the nature of human life itself.

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THE FAIR MOORS OF OCEANIA

MARGE E. LANDSBERG

Linguistic reservoirs present all but timeless evidence of the complex linguistic, and hence archeo-ethnic elements they store. For linguist and anthropologist alike their meticulous re-investigation is therefore of inestimable moment. Because of their previous almost complete geographic isolation, the Oceanic languages present a perfect 'laboratory' for such investigations.

Recent researches of phylum linguistics have brought to light some important, and hitherto unrecognized, components of this group which, both lexically and structurally, point to Indo-European and Hamito-Semitic antecedents.

Although generations of linguists brought up on Bloomfieldian etymological taxonomies of cognates generally believed that the world's languages had been definitely and satisfactorily assigned to groups and families on the basis of certain rigorous and definite resemblances, in our day there are today investigators who have come to realize that much of historical linguistics, including the traditional genealogy of the languages of the world as written in the existing textbooks, is inadequate.

To replace the old order by a new and better one will require years of work by many scholars. The prospect seems forbidding. And yet we are constantly rewriting linguistic – and hence anthropological and ethnic – history. In so doing we are clarifying the ethnic past of living peoples.

Though many of the publications in this area are technical, sophisticated, and more often than not polemical, the linguist or anthropologist who chooses to ignore them surely does so at his own peril and at the peril of the future integrity of his discipline.

Since paleolinguistics is in essence a sort of linguistic archeology for which we have developed an explicit methodology (Landsberg 1978b:209), as also for ethnoarcheology (Stiles 1977), we are able to reconstruct a considerable amount of precise information, provided we no longer neglect exploiting all essential data, and do not miss what may well prove to be our most important if not our sole reliable clue: the linguistic

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component (Landsberg 1976d:3).

Historical Background

Interestingly enough, in Oceania as well as in the New World, linguists seem to have been so concerned about problems of interlingual genetic classification, that they have tended to overlook the rich potential of intralingual reconstruction work as a bona-fide tool for recovering far greater, far more important quantities of historical information, no doubt with stunning interdisciplinary implications. Yet the most vital importance of contributions to be made by historical linguistics must surely lie in the human implications of the provision of these essential data needed for the complete and correct historical reconstruction of particular peoples in quest of their true ethnos. Let us therefore first of all consider our dearest assets: the linguistic phenomena in situ.

Now, according to a hypothesis promulgated especially by Wilhelm Schmidt, (1) there exists in Oceania a great linguistic stock, the family of Austric languages, consisting of two major branches: 1) the Malayo-Polynesian languages, including most languages of Malaysia, Polynesia and Melanesia; and 2) the Austroasiatic, whose numerous tongues extend over a vast area, the limits of which are not yet quite clear. Three subfamilies were said to comprise Austroasiatic by adherents of this theory: (a) Mon-Khmer; (b) the Munda languages of the Himalayas; and (c) Annam-Muong – which was said by others rather to belong to Thai.

The proponents of the Austroasiatic hypothesis claimed that the relationship among the various groups in question was a genetic one. That is to say, that they were descendants of a common linguistic ancestor. The nature of the data adduced was such that it seemed to justify serious attempts to reconstruct these proposed parent forms. As they set out to support their notions with the authority of comparative linguistics (philology), we have today the brilliant comparative studies of von Humboldt (1880), Dempwolff (1938), Wurm (1973), and others. (2)

(1) A well-known German priest and anthropologist, who founded the Anthropos Institute and the journal *Anthropos* in 1906.

(2) In: Krupa (1973).

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However, it seems that here and there the reconstruction work was not always proceeding as fast and smoothly as had been expected. There was, first of all Bopp (1840), who suddenly reported on a possible relationship of the Malayo-Polynesian with the Indo-European languages. Soon other scholars, like Gonda (1932), and Brandstetter (1937), followed and supported their work. Meanwhile, other voices too, were heard. The three famous 'Rs' in philology, Ronkel (1902): Tamil (Dravidian)-Malayan; Rivet (1925): Australian languages -American Indian; (1926): Malayo-Polynesian-Amerind; (1929): Sumerian-Melanesian; and Ramaswami (1929-1930): Austric-Dravidian, published their papers. (3) There were even some lonely prophets like Davies (1832), who compared Polynesian and Hebrew; Woelfel (1955), who believed in the former existence of a widespread "Atlantic-Libyan" language family whose western "Atlantic" branch manifested itself not only in Roman substrata but also in some of the other "European-peninsular"groups of Indo-European, particularly such as Celtic, Germanic and Balto-Slavic — and up to the Guanche language of the Canary Islands, whose populations are thought to be of ancient Cro-Magnon origin. (4) Finally, in our own day, there is the work of the well-known Swiss linguist, Linus Brunner (1976), whose comprehensive Hamito-Semitic, Indo-European, and Malayo-Polynesian studies complete the work for the time being.

(3) In: Landsberg (1978c).

(4) The Guanches were the inhabitants of the Canary Islands met by the Spaniards when they undertook the conquest of those islands at the beginning of the fifteenth century. The name is more precisely applied to the primitive inhabitants of the western group of islands; those of the eastern group, notwithstanding their affinity to the Guanches, form a separate type called Canarios. It is thought that both populations came to northern Africa with other populations from central and southern Europe, ultimately settling in the Canary Islands, where they lived for centuries in complete isolation, thus presenting rare 'laboratory' situations for study. Interestingly enough, of brown complexion, they had blue or gray eyes and light-coloured hair, which are still distinctive characteristics of a large number of the present inhabitants of the islands. Alphabetiform engravings and characters were discovered as curious vestiges of their culture. Even more interesting, they were found to be monotheists, holding court in the open air. As a final point of interest it may be mentioned here that the Guanches employed certain methods of embalming which were distinctive of the Egyptian techniques of the twenty-first dynasty.

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Linguistic Evidence

Interestingly enough, in our regions, and occasionally elsewhere, (5) those who were aware of but not specifically working on this problem just kept wondering on and off why they as speakers of Hebrew would find say, Maori, at least partly intelligible. Gradually it became clear that as they looked back in space and time, these 'coincidences' increased, so that the more 'primitive' the vocabulary, the richer the linguistic harvest. The core seemed incredibly well preserved. However, in fact, this phenomenon has already been pointed out by Buck (1971:v), who observed that "in a limited number of words for certain concrete notions the meaning has remained virtually constant for thousands of years."

A preliminary survey proved this to be only too true for Hebrew and Maori as well. Thus we found for instance all these predictions verifiable without too strenuous an etymological effort and almost with the regularity of a clock. Below follow some poignant examples: (a) for the *numerals*, Hebrew *šālōš*, Maori *toru* 'three'; for close *family (kinship) relationships*, Hebrew *bbēn* 'son', Maori *whanau* 'family'; Hebrew *šif^{c}hah*, Maori *hapu* 'tribe'; (c) for *human body parts*, Hebrew *ppānīym* '(front of) head, face', Maori *pane* '(back of) head'; (d) for *nature phenomena*, Hebrew *mātār* 'to drizzle, rain', Maori *maturu* 'to trickle'; Hebrew *bbārāq*, Maori *wheriko* 'lightning'; (e) words for or names of non-cultural goods, *non-domestic (non-trade) animals*, Hebrew *nāhās*, Maori *nakahi* 'snake'; Hebrew *ppar^{c}ōš*, Maori *puruhu* 'flea'; and (f) for everyday *verbs denoting concrete notions*, Hebrew *mēt*, Maori *mate* 'to die'; Hebrew *bbārār*, Maori *whiri* 'to examine, choose'; Hebrew *kāpar* 'to cover (up), conceal', Maori *kopare* 'to veil, shade (the eyes), conceal'. These already clearly hint at the system of regular phonetic correspondences that was to emerge upon closer scientific scrutiny and of which nearly a thousand samples can be found in Brunner (1976). Below follows a graphic representation of the underlying principles.

(5) Professor Adele Shafer in New Zealand (cf., Brunner 1976, Preface).

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Sem	I.E.	Mal-Pol	Mal	North-P	South-P	Marq	Tag	Tong	Sam	Tahit	Hawaii	Maori
M	M	M	M	M	M	M	M	M	M	M	M	M
N	N	N	N	N	N	N	N	N	N	N	N	N
L	L	.	L	L	R	Ø	L	L	L	R	L	R
R	R	.	R	L	R	.	L	L	L	R	L	R
P	P	P	P	.	.	.	P	B	P	P	P	P
K,Q,Ḵ	K,&c.	K	K	.	.	K	K	K	'	'	'	K
G,Ḥ	G(H)	.	G	.	.	K	G	K	.	.	.	K
c	Ø	NG	NG	.	.	N	.	G	G	Ø	N	NG
(Akk. Ø)	(Except Hitt.H)											
D,T	D(H),T	T	D(ass.T)	T	T	.	T	T	T	T	K	T
B (Med.W)	W	.	B,W	V	V	V	B	V	V (But F before I,O,U)	V	W,H	W (But H before O or U)
B	BH	.	B	.	.	.	B	F	F	V (But H before O)	H	WH (But H before O or U)
S,Š,Z	S	H	S	H	H	H	S	S (But H before I,O,U)	S	H	H	H
H	Ø (Except Hitt. H)	H	H or Ø	.	.	H	H	.	Ø	.	H	H or Ø
D	D	(Proto)D,D	D,T	L	R	.	D,L	L	L,R	R	L	R

As the stock of known items increased, and the rules became clear, suggestions of 'chance', 'borrowing', or 'diffusion' dwindled. Slowly then the question arose if it could indeed be possible that there existed some underlying connexion rooted in past migration (Dyen 1956, 1970; Gonda 1932; Matsumoto 1928; Miller 1971; Murayama 1977; Petrov 1967; Todd 1971; and see also Wauchope:4, 54, 106).

Clearly, not enough is known yet at this stage. But it seems quite possible that further research may well establish a demonstrable connection.

For although the ancient peoples are gone, and so are,

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alas, many of their tongues – indeed, often beyond retrieval – yet even today's world still contains a treasury of both prehistoric and historic evidence for us to explore and ponder over. It is found in rocks, and it consists of fossils, stones, and shards. Indeed, the fossils are often found in rock well enough preserved so that millennia later the rock or the fossil can be exposed, examined, dated and interpreted. Whatever does not perish with the decay of time can be found or dug up and scrutinized.

Thus began the work of the Epigraphic Society (6) which, founded by Prof. Barry Fell of Harvard University, devotes itself to the study of ancient inscriptions upon stone, clay, metal, ivory, or other enduring materials, like seashells or fossils, wherever these are found. Mostly designed to convey information or to record events, as for instance the inscriptions on the famed Rosetta, Metcalf or Bat Creek stones, (7) such inscriptions are often the only source of information from which we can draw our knowledge of early history.

The question may well arise here how it is that things – always travelling in animate hands – end up so far from home? The answer seems to be that from olden times this curious animal called 'man' has been prone to an adventurous urge to travel and penetrate unknown territories. Starting from the ubiquitous Australopithecus, who appears to have dispersed widely over the world at an early date, and followed by the Neanderthals, Cro-Magnons, and many others of paleo-, meso-, and neolithic status, we finally find inevitably that the Egyptian Pharaohs are but perpetuating that very ancient human tradition, when they equip their notorious expeditions to various far-off lands.

(6) Formerly the Polynesian Epigraphic Society.

(7) The first is well enough known; the second, discovered in Georgia, U.S., in 1966, was inscribed with ancient Aegean writing, and believed to have reached America through the Mediterranean and the Gulf of Mexico. See also Gordon (1971) and Stieglitz (1976) for the Bat Creek Stone which, bearing an ancient Judean (Phoenician-Hebrew) inscription reminiscent of that found on Jewish coins from the Roman period (that is, those minted during the rebellions against the Romans: the Jewish War, 66-73 A.D., and Bar-Kochba's Revolt, 132-135 A.D.), and which was discovered in a sealed archeological context in an excavation conducted by the Smithsonian Institution in Loudon County, Tennessee, in 1885.

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Fair Moors

Now, where do our fair Moors come into the picture? What we know of the origins of the Polynesians is little more than bare conjecture — some of it rooted in mythology. There were rumours of missionaries who, having arrived on Easter Island, took steps to remove all traces of the pagan civilization they found. Thus it was said that the wooden tablets covered with hieroglyphics they had discovered at the feet of the pagan statues, were all burnt instantly — but for some were dispatched to the Vatican Library, which is reputed to to house many such secrets in its cellars (Hallet and Pelle 1973:328). At any rate, the first Europeans to visit these regions seem to have been quite amazed to discover that the inhabitants included a race of Caucasoid men, with beards. They took great pains to find out from these natives whatever they could tell them about their past and where they were said to have come from. But apart from some references in local legends to a 'Master Race of Teachers' of great antiquity, who had 'fallen from the skies' (Paulwels and Bergier 1968: 172-173), some recurrent tales of certain legendary migrations of the 'Children of the Sun' from Egypt (Keesing 1971:271), which no one at the time seems to have taken very seriously, and some mild wonderment at the Polynesians' habit of mummifying their deceased nobles, nothing appeared concrete enough to make scientists prick up their ears. Scientists like 'hard facts' — such as the Polynesians calling their god *Atua* (cf. Brunner 1976:103, Polynesian *Atua* = Greek *Zeus*), and the designation of the sun's disk as *Raa* (the Zeus of Ancient Egypt) personifying Egyptian *ra* or $r\bar{e}^{c}$, the sun, for he is 'the shining or resplendent one', probably all these from I.E. *$r\bar{a}$-, to which also English *ray* 'a beam, line of light', Latin *radius*, etc.

Some found it quite intriguing to find out that the Polynesians' system of worship seemed to contain remnants of some solar religion, the manifestations of which appeared to be akin to the influences of the so-called Aton-hymns of Hebrew cult lyrics, as found in Psalms 19:4-6; 104. And yet, so far, nothing was quite concrete enough for academics, despite the enthusiasm of some laymen (e.g., Heyerdahl 1971).

Indeed, it was not until some of the tablets that had evident-

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ly escaped the missionaries' eyes reached Dr. Fell at the Epigraphic Society, and he set himself to the difficult but rewarding task of decipherment, that all the various bits and pieces of the previous mass of seemingly random data fell together into a stunning kaleidoscopic picture.

Making ingenious use of his knowledge of both Polynesian and classical Greek, Dr. Fell specifically concentrated on an ancient inscription written in Egyptian hieroglyphs found on Pitcairn Island (southwest of Tahiti) which, surprisingly enough, turned out to relate the story of a shipwreck. Soon another such tablet followed, this time from New Guinea, which turned out to be no more nor less than an exactly worked out theorem by the well-known contemporary Greek scholar, Eratosthenes (Brunner 1975a), c. 276-194/2 B.C., born at Cyrene, the ancient capital of Cyrenaica, proposing the almost exact calculation of the circumference of the earth — a marvel of precision for those early days.

Was it miraculous coincidence — or could this have been that ancient and almost divinely worshipped 'Master Race of Teachers', the 'Children of the Sun', from Egypt? That would certainly account for the many Egyptian and Greek loanwords that had meanwhile been discovered, and of which Prof. Brunner mentions, for instance, Maori *hakāri* 'feast, gift', Egyptian *hakr* 'a religious festival'; Maori *tari* 'a mode of plaiting', Egyptian *T3yt* 'goddess of weaving'; Maori *kona* (Hawaii *huina*, etc.), Greek *gonia* 'angle' (Brunner, 1975b, 1976).

Subsequent chronological inferences soon provided some more pieces to fit the jigsaw puzzle of this particular phylum at least. For if we now ask who could have equipped such expeditions in Eratosthenes' times, the date clearly points at the period of Ptolemy III Euergetes I (King of Egypt 246-221), who reunited Cyrenaica to Egypt at the beginning of his reign. (8) And indeed, as expected, what we find is precisely the language of that era, known to be an epigraphic variety which, emerging right then and there, for the first time distinguished /l/ from /r/. It was mostly used for priestly decrees engraved on

(8) It had been independent since c. 258 (cf., Berenice); Rowe (1948). Appelbaum (1969).

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stelae, often in double or triple versions – just like on the above-mentioned Rosetta stone – which of course greatly facilitated their decipherment. This variety – the late demotic (or 'popular') – represented approximately the speech of the 26th dynasty. It was very similar to Coptic which, descended from ancient Egyptian and prevailing from about the 3rd century A.D., also is a member of the Hamito-Semitic family.

Eratosthenes' 'Cyrenaican Greek' (the Doric dialect) had been brought to these regions by colonists from the lower Greek islands, taking with them the local idiom of their mother city (Rowe 1948). Herodotus relates how, on the advice of the oracle at Delphi, a small group of Greek emigrants driven by famine from the island of Thera (Santoris) set sail for the ancient kingdom of Libya about 630 B.C. (Hölscher 1937). The eastermost district, Cyrenaica, having much to remind the colonists of their native land, they settled there first. About 631 B.C., Cyrene, the original capital of ancient Cyrenaica, and most august of all the Greek colonies, was founded by Battus.

In Cyrenaica classical Greek archeology has indeed been found represented in the remains of Cyrene and in finds of pottery at Teuchina, some with inscriptions in their native (i.e., Doric) dialect. So much for hard facts so far. In fact, just as Ionic was spoken in the Milesian settlements on the Black Sea coast, Attic all over Asia Minor, Syria, Mesopotamia and Egypt at this time, so Doric was found from Corinth to Corfu, in Syracuse, Sicily, South-Italy, from Megara to Byzantium, up to the Crimea, and from Thera to Cyrene. The Doric dialect preserved the broad /ā/ sound, as in Greek *mater* 'mother', modified into long /ē/ (our /ei/ in English 'mate') in Attic-Ionic, and other easily recognizable characteristics, such as the termination of the verb in *-ti* for the 3rd person and in *-ness* for the 1st person plural. Incidentally, in comparison with other Indo-European language, Doric, among Greek dialects, shows preserved forms.

Thus, retracing the antecedents step by step, Dr. Fell was able to explain the strange déjà-vu feeling that had swept over him when he was first shown the Polynesian tablets. Indeed, he now knew that these were beyond the shadow of a doubt almost identical to some others that had been shown to him at some time in Libya upon his stay in North Africa. There

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they had been recognized by the French scholar, J.F. Chabas, for what they were, though, presumably because of their great antiquity, he had been unable to interpret them linguistically.

The problem now became concentrated on the question of *who precisely had been these ancient inhabitants of Libya*? Now, the term Libya as used by the ancient Greeks referred generally to North Africa comprising the southern littoral of the Mediterranean from the Nile delta to the Atlantic, and also its desert hinterland and oases. The name derives from a single tribe established in eastern Cyrenaica early in the 2nd millenium B.C. The territory in general demonstrated probably a considerable degree of uniformity of race and culture. Indeed, prehistoric rock engravings in Algeria and Tripolitania datable roughly to the 2nd and 3rd millenia B.C., show distinctive features of headdress, clothing, ornaments, and religious practices that can be recognized on Egyptian monuments and other works of art. By the Middle Egyptian kingdom personal and tribal names, epithets, etc., reveal that in the east, at least, these people spoke a Hamitic language akin to the Berber (9) dialects now found from Siwah in Egypt to Morocco. Their physical type was clearly Mediterranean and contrasted thoroughly with the negroid races inhabiting the desert to the south. Their way of life was that of shepherd nomads loosely organized into tribes and confederations. From the Old Kingdom onwards the Libyans constantly encroached on the settled populations of the western delta, and this tendency seems to have been dramatically accentuated during the great period of migration in the eastern Mediterranean region in the latter part of the 2nd millenium B.C. It was also about this time that they were joined by culturally more advanced seafaring peoples from the north and west in a series of attacks on the delta (Clark 1970).

So when we now stop for a moment to ask ourselves who then precisely were these ethnic groups whose tongues we dis-

(9) A Caucasian people, the Berbers are related in physical type to the Mediterranean subgroup of southern Europe. The Berber language is a subfamily of the Hamitic linguistic group. It is believed that the Berber-speaking peoples came originally from the eastern Mediterranean area before 2.000 B.C., and that they moved across North Africa and went as far as the Canary Islands, where a Berber language, Guanche (q. v. above) was spoken when the Spanish landed there in the fifteenth century A.D.

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cussed at the beginning of this paper, and why we find that these are at least partly intelligible to speakers of Hebrew (and hence, possibly, to speakers of Hamito-Semitic in general), right here we seem to be coming closer to the answer to this puzzling question, or at least so for a certain important phylum.

For it seems that Bopp (1840) was indeed right; and so were apparently Davies (1832), though his methods may not always have been as flawless and exact as could have been desired and, in our own day, Brunner (1976), whose scientific comparative linguistic approach is of course beyond dispute (cf. Malone 1973b). Hence, if we seek a tentative explanation for this apparent instance of generic relationship, we must consequently look to the Middle East or northern Africa, as the possible source of 'proto-Polynesian'. I myself incline towards ancient Cyrenaica and Egypt, or even the area of present-day Algeria and Tripolitania.

What we know of the ancient inhabitants of this area indicates that they arose from an originally Hamitic population which with later Arab infusion gave us three major ethnic groups: in central Sahara, the veiled *Taureg* who are still camel nomads; in the east the *Tebu*, who closely resemble the Tuareg, though there has been considerable admixture with negroid peoples; and ultimately, in the once so fertile and prosperous western Sahara, the *Moors* (10) who, far from being as black as the Elizabethans still presumed them to be, are in fact called by their neighbours *beidan* 'whites' (11), to distinguish them from the *sudan* or 'black peoples' of the Sudan.(12) These native Moors, Mauri (or *Maori* possibly, indeed till today still pronounced /mauri/), spoke a Hamitic dialect akin to the Berber tongues alluded to above.

And was it thus that the language — or better said, its speakers — native North-Africans, manning Egyptian ships

(10) *Moor* comes into English via French *More, Maure*, from Latin *Maurus* (plural *Mauri*) from Greek *Mauros*, ultimately of obscure origin, but perhaps originally just meaning 'person.'

(11) From Arabic *bada* 'to be white;' *'abjad* 'white;' to Semitic root *bws* 'to be white, to surpass in whiteness,' where also belong Hebrew *bēysāh* 'egg,' so called for its hue, and *būs*, (LXX: *byssos*, V: *byssus*), first mentioned in Ez 27 16, 'linen, or cotton' (Gradwohl 1963:49-50).

(12) From Arabic *saudā* (fem. of *áswad*) 'to be black;' plural: *sūd* 'blacks,' evidently sharing its ancient root with the Indo-European base English *swart(hy)* 'dark in complexion' belongs to (cf. Brunner 1969:988).

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under Greek know-how, around the beginning of the 3rd century B.C., sailed the oceans and dispersed all over the Pacific, apparently also reaching the New World. That, at least, would account for the Hamitic phylum in Amerind, while a more specifically Semitic phylum (Leesberg 1903; Schwarz 1929; Landsberg 1978e) may be accounted for by yet earlier voyages of the Phoenicians who, according to the latest finds of the Epigraphic Society (Fell 1974a, 1976, and pers, comm.), sailed up the Connecticut, Merrimack and Hudson rivers. (13) These seem to be dated from about 800-100 B.C., most, however, being Carthaginian in origin. (14)

Conclusion

The case of the Polynesians may well prove to be one of the most dramatic instances of cultural transfer by way of human migration. Many anthropologists still resist the theory of a substantial western Hamito-Semitic or possibly Indo-European component in Polynesian culture, but the evidence for both is accumulating. In terms of ethnicity, we may say that we are observing an example of random cultural as well as random genetic drift. The important role of random genetic drift in the history of mankind has been stressed by Ernst Mayr (1966), who called it "founder-effect". Founder effect and random genetic drift occur when a small "seed stock" population breaks away from the parent stock and migrates into a new environment in which it loses genetic contact with other groups. Under such circumstances rapid genetic drift may occur due to the relative smallness of the group which in many instances may represent nothing more than a single boatload of people. Certainly, it seems that after the ancestors of the Polynesians reached the Pacific, many island populations were founded by very small groups of settlers, usually representing not more than a few boatloads of migrants. The genetic drift that may occur in such cases can also be accompanied by cultural and linguistic drift, accentuated by environmental selection and stimulation, as new needs arise and new patterns of life evolve.

(13) Iberian, Punic and Hebrew inscriptions just unearthed in archeological digs at Nawa-Qunun, one of America's oldest settlements (Fell, personal communication).

(14) But see also Gordon (1971), and Stieglitz (1976).

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While many anthropologists still talk about cultural diffusion it is becoming increasingly necessary that we also recognize how migration, frequently of very small groups, transforms vast areas, changing dramatically the racial, linguistic and cultural composition. For those who are interested in the "composition" of Polynesian culture and the elements to be found in it (the 'origins' or 'roots')the message of this paper is that the linguistic history of the Oceanic languages may well mirror effectively the migrations of the ancestors of those who speak those languages (c.f. Dyen 1956; Swadesh 1959).

Developed as an intricate fusion of several unpredictably modified stocks, the language was gradually molded to serve a wide range of communicative needs. As the society which used it achieved cultural autonomy, the language too became an unusually vivid record of the various cultural, ethnic and linguistic specifities that were its ingredients. Thus, Indo-European and Hamito-Semitic elements form an integral part of an uninterrupted development in speech form. Together with Altaic (see the work of the Nostratic linguists as mentioned in Landsberg 1978b, and further such as for instance, Miller 1971; Brunner 1976; Murayama 1977), and Indo-Chinese, they represent the present linguistic stage of a continuous process, involving not only vocabulary but also morphology and syntax, previous stages of which have crystallized magnificently in the ancient language of courtesy, used on formal occasions, both religious and secular.

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BOOK REVIEWS

EUGENICS AND POLITICS IN BRITAIN 1900-1914
By G. R. Searle, Noordhoff International Publishing, Leyden, 1976, 146 pages.

The current disputes arising over the "social morality" of genetic research — an area of science which has revealed some of the most dramatic breakthroughs during the past decade — makes *Eugenics and Politics in Britain* a timely book which will attract much more attention today than it would have drawn ten years ago.

Although some may assume that the author's restriction of his study to Britain reduces its significance, those who know more of the history of the eugenic movement will know that the idea of modern, scientific eugenics not only originated in Britain, but also that subsequent enthusiasm for eugenic research was stronger in Britain than in almost any other country of the world, possibly excepting only Germany and the United States.

To quote the definition of eugenics supplied by the man who coined the term, Sir Francis Galton, eugenics is concerned with "the study of agencies under social control that may improve or impair the racial qualities of future generations either physically or mentally."

A relative of Charles Darwin, Sir Francis Galton, and his colleague Karl Pearson — the founder of the biometric laboratory at the University of London — were the prime pioneers of eugenics. In consequence, and understandably to geneticists, it is not surprising that early eugenic science was almost indistinguishable from early research in statistical science, which also came into existence largely due to the work of the same two men. This close relationship between statistics and eugenics still exists, because the study of genetics — and of eugenics, representing the application of genetic science to human welfare — is concerned primarily with "breeding populations," with patterns of genetic frequency within specific genetic continuua or gene pools, rather than with individual human beings studied as isolates. Eugenics is there-

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fore concerned with the genetic constitution of breeding population, as a whole, thus depending heavily on statistical frequencies and correlations.

Enthusiasm for genetics reached a peak in Britain prior to World War I, when concern regarding the "selective" loss of life among childless young men in the Boer War became the subject of popular debate. Despite the far greater impact involved in the bloodletting of World War I, not only to Britain but all European nations, public concern for eugenic policies declined heavily in Britain during the 1920s, in favor of economic concerns resulting from the Great Depression.

Nevertheless, author G. R. Searle reveals that in contrast to the present decade, when there is a clear confrontation between geneticists who uniformly insist that the genetic heritage sets the potential limits of human achievement, and the social equalitarians and libertarians who fear genetic engineering as likely to promote hierarchical and inequalitarian social attitudes, the early eugenics movement combined under its banner men and women of widely different political and social backgrounds. Thus, while little support for eugenics was forthcoming from the "captains of industry" – the bankers or businessmen who were too concerned with matters of profit and immediate material gain to interest themselves in the long term future of the nation – considerable support came from socialist intellectuals such as George Bernard Shaw and Professor J. B. S. Haldane.

However, in general it may be said that the main supporters of eugenics have traditionally been drawn from secure middle class backgrounds, while the main opposition was – at least in the earlier days – from Roman Catholics and libertarians.

In the political arena the first major conflict involving eugenicists centered around the welfare legislation introduced by the Campbell-Bannerman and Asquith administrations. Lloyd George and Churchill, were both attacked as ignorant men who were inadvertently reversing the work of thousands of generations of natural selection. They were likened to "bad stockmasters" who were frustrating the laws of biology.

As a result of this crystallization of the relationship between eugenics and politics, socialists and liberals tended to become more strongly opposed to eugenic policies, and converts to the eugenic ideal tended to become restricted more severely to

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those who were politically hierarchical or technocratic in their leanings. However, author Searle believes that in reality there is no reason why eugenics should not receive the support of socialists wishing to reduce social and economic inequality by raising the overall genetic level of the population and thereby reducing biological inequality.

The contemporary weakness of the eugenics movement, despite the advance of genetic science, is emphasized by the author largely in terms of a widespread and "deep-seated prejudice against any attempt to formulate a social policy shaped by 'biological' considerations" since World War II, and also – interestingly – partially as a result of increasing specialization in population sciences (such as demography) and professions (genetic counselling), which have tended to develop along their own independent courses as a result of over-specialization and an inability to recognize the inter-disciplinary implications of work in these essentially related fields.

WITCHCRAFT AND SORCERY:
AN ANTHROPOLOGICAL PERSPECTIVE OF THE OCCULT
By John A. Rush, Chester C. Thomas, Springfield, Illinois, 1978, 166 pages.

John Rush deals with the theory of witchcraft and sorcery, including occult beliefs and practices in Europe, Africa, America and Asia. He discusses the relationship between the occult and psychotherapy. In addition, he examines Italian occult ideas which have lasted to the present day, such as the *corno*, the *mano cornuto*, and the *Mano fica*.

ETHOS AND IDENTITY: THREE STUDIES IN ETHNICITY
By A. L. Epstein. Tavistock Publications Aldine Publication Company, Chicago and London, 1978. 181 pages.

The author examines tribalism on the Copperbelt, ethnic identity in Melanesia, and Jewish identity in the United States. As Professor of Social Anthropology at the University of Sussex, he contests the popular belief that as man advances

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he will develop wider horizons, and claims to the contrary that the drive toward ethnicity is such that even as the integrity of an ethnic group is threatened, a defensive reaction develops or else loyalty is transferred to a newly conceived ethnic identity.

Epstein examines the Jews in New York, and perceives that the younger Jews frequently refuse to attend the synagogue, just as many young Christians refuse to go to church. Yet the younger generation shows a change as its members graduate to middle age, becoming more tolerant of the synagogue, and futhermore, expressing their ethnicity by marrying within the Jewish community.

This book focuses on ethnic identity, how it is generated and transmitted; the role of grandparents in the formation and understanding of ethnic identity; and does so with an emphasis on present day societies, rather than historical tribal or national situations.

PACIFIC ATOLL POPULATIONS: A.S.A.O. MONOGRAPH No. 3
Edited by Vern Carroll. Published by An East-West Center Book, East-West Population Institute. University Press of Hawaii, Honolulu, 1975, 17 illustrations, 164 tables, 528 pages.

A well balanced work on the various peoples of Micronesia. *Pacific Atoll Populations* comprises the work of numerous authors, each skilled in his own sphere. Subjects covered include: Populations of the Outer Reef Islands (William Davenport), The Strength of the Land (James D. Nason), Changing Patterns of Marriage and Migration on Namoluk Atoll (Mac Marshall), Makin and the Outside World (Bern Lambert), The Central Polynesian Outlier Population Since European Contract (Tim P. Bayliss-Smith), The Population of Nukuoro in Historical Perspective (Vern Carroll), and Ontong Java: Depopulation and Re-Population (Tim P. Bayliss-Smith).

A CHOICE OF SUNDIALS
By Winthrop W. Dolan. Battleboro, Vermont, U.S.A., 1975. 148 pages.

A delightful work which deals with the history of sundials, tracing these from Early Egyptian shadow clocks (it illustrates

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a fragment of a late Egyptian sundial of about 3000 B.C.), Greek and Roman sundials (Cicero sent one from Rome to his country villa at Tasculium) and even an ancient Chinese "book of sundials" (unfortunately now lost) which appeared in the first century B.C. Chinese sundials appeared to divide the day into one hundred parts, in contrast to the twenty four hours of the Western world.

THE CLASSIC MAYA COLLAPSE

Edited by T. Patrick Culbert. University of New Mexico Press, Albuquerque, New Mexico. 549 pages.

Comprising a collection of essays on the hitherto unexplained collapse of the Mayan civilization, this book has the merit of marking diagrams, figures and tables from the beginning to the end, instead of by chapter, which makes so much trouble for the reader. In it, Richard E. W. Adams reviews previous theories relating to the Mayan decay, and the archaeological evidence is analyzed by Robert L. Rands, Culbert, Gordon R. Willey, Sabloff, Adams, John A. Graham, William R. Bullard, Jr., and E. Wyllys Andrews, Jr. Attempts at a new interpretation are made by Demitri B. Shimkin, Frank P. Saul (who discusses the possible role of disease), William T. Saunders, Malcolm C. Webb, William L. Rathje, and a concluding assessment is written by Willey and Shimkin. An excellent collection of references are cited and the book deals effectively with its subject.

THE SWORD AND THE FLUTE: KĀLĪ AND KṚṢṆA, DARK VISIONS OF THE TERRIBLE AND THE SUBLIME IN HINDU MYTHOLOGY

By David R. Kinsley. University of California Press, Berkeley, Los Angeles and London, 1975, 167 pages.

Authored by a member of the Department of Religion at McMaster University, this publication compares and contrasts the roles of Kṛṣṇa, embodying such Hindu themes as divine sport and bliss, and Kālī, illustrating the Hindu view of destruction in relation to infinite and cyclical time. Although different,

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they reciprocate divine functions as understood among the Hindus. Contemporary Hindu religion cannot be wholly understood in terms of its Indo-Aryan origins, since many of its concepts and personalities represent a reemergence of pre-Aryan religious concepts.

EARLY MAN AND THE OCEAN

By Thor Heyerdahl. George Allen and Unwin, London, 1978, 192 pages.

Although most anthropologists reject the views of Thor Heyerdahl, there can be no doubt of his ability to write thought-provoking books. In this latest, he seeks to investigate all the routes by which seaborne colonization could have occurred, basing his arguments on undoubtedly sound maritime experience.

Turning to the rival claims of parallel invention versus migration and diffusionism, Heyerdahl then makes his case for the widespread transfer of culture by way of seagoing migrations. Following his earlier published research in this area, he draws attention to the number of parallel cultural motifs shared by Central America and the European – West Asian continuum. He also reinforces his earlier statements regarding cultural contacts between Polynesia and the Mediterranean by way of Central America. Indeed, in an extension of this view Heyerdahl reasserts his opinion that there was once a Caucasoid infusion into Central America, quite separate from any Indian element in the Malayo-Polynesian population, producing evidence of Caucasoid crania and hair texture and colouring from mummified remains.

THE STORY OF SCOTLAND

By Janet R. Glover. Faber and Faber. London, 1977. 394 pages

The authoress traces the origins of Scotland from the earliest times. She appears, in the light of later knowledge, to have made the dates for the prehistoric landings of peoples a little short.

This is a comprehensive work and covers nearly all aspects of Scottish history – right up to the Scottish Nationalist Party.

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Obviously some views are controversial as this is the fate of all histories.

EARLY HYDRAULIC CIVILIZATION IN EGYPT:
A STUDY IN CULTURAL ECOLOGY
By Karl W. Butzer. University of Chicago Press and Buckingham Palace Road. London, 1976. 134 pages.

The author, who is a professor of anthropology and geography at the University of Chicago, presents a valuable analysis of technology and land use in Egypt from prehistoric through dynastic times. Based then, as now, on irrigation, the economy and society of the people of rural Egypt responded massively to the ecological dictates of their environment. This study, which will be of interest to anthropologists, cultural geographers and archaeologists alike, can also be read to advantage by those concerned with the contemporary agricultural problems arising from the construction of the Nasser dam.

OUR CONTRIBUTORS

F. J. IRSIGLER
The South African Association for the Advancement of Science

DAVID STEPHEN ENGELSTAD
University of Northern Iowa

HENRY H. REITER and MICHAEL SIMON
16 Sunnywoods Drive
Huntington South, New York 11766

VOLKMAR WEISS
Zentralinstitut für Jugendforschung, Leipzig

ROGER PEARSON
Hampden Sydney College

J. W. JAMIESON
Institute for the Study of Man, Washington, D.C.

MARGE E. LANDSBERG
Haifa University

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